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Evaluation of the Potential for Disaster Risk Reduction in the Kingdom of Saudi Arabia

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PhD

2017

Evaluation of the Potential for Disaster Risk Reduction in the Kingdom of Saudi Arabia

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A thesis submitted in partial fulfilment of the
requirements of the University of Northumbria
at Newcastle for the degree of Doctor of
Philosophy

Research undertaken in the Faculty of
Engineering and Environment

July 2017

Abstract

Disasters, both natural and human-made can have severe impacts on communities and infrastructure. The approach to minimising the impact of such events is Disaster Risk Reduction. This research looks at weather related disasters in the Kingdom of Saudi Arabia and methods used to reduce risk. The research was undertaken using a mixed methods approach. Some 200 people, both male and female, were sampled using questionnaires in four different provinces of the kingdom. The purpose was to gain an understanding of their knowledge of hazards and preparedness. Interviews were held with a number of key stakeholders in disaster management. Focus groups were conducted with religious leaders in order to gain an understanding of the role of Islam in risk reduction.

The results showed that the majority of questionnaire respondents lacked knowledge and information about disasters in their places of residence. Further, they are not well prepared to face the risks of natural disasters and lacked knowledge of how to mitigate their risks. However, the majority of participants strongly believed they can minimize the risk of disasters and they were enthusiastic to participate in any efforts of disaster risk reduction in the kingdom.

The Saudi government is building a disaster management system. However, it needs a greater focus on raising community awareness and preparedness. The research finds that the mosques has the opportunity to play an important role of in raising community awareness and preparedness. The Holy Quran teaches that protecting the environment and all creatures is part of Islamic worship. An extreme version of the fatalistic view of natural disasters is not fully supported in this study, which argues that natural disasters might have many other interpretations, such as a test from God, a natural process and a result of humankind's negative intervention in nature.

The role of the mosque, which has a special sacred place in the life of every Muslim, has been researched. The research shows that the mosque has a central role in the life of Muslims but this role seems to have declined recently. The strategic position of the mosque and its special status in the life of every Muslim make it a very important place for effective natural disaster risk reduction. This study suggested possible roles for the mosque to raise awareness and to help with preparedness. Some practical steps are suggested to integrate Islamic teachings into the policies and strategies of natural disaster risk reduction in the Kingdom of Saudi Arabia.

These steps are based on previous research about the role of religion in disaster risk reduction and the findings of this research.

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Acknowledgement

First of all, my most earnest gratitude praise is due to Allah, the lord of creatures who taught man the whole science and the names of all things.

I would like to express my thanks and gratitude to the Saudi General Directorate of Border Guards who were generous in giving me the chance to pursue my higher studies in the UK.

I am also greatly indebted to my principle supervisor Dr. Geoff O'Brien for suggesting and supervising this thesis. I closely worked with him throughout the different stages of this study, and he gave much of his time in guidance and fruitful efforts. This study would have never been achieved without his great effort and support.

My Special thanks are due to Prof. Phil O'Keefe for his support, assistance and encouragement during the progress of this thesis.

I wish to express my gratitude and appreciation to my friend Dr. Amer Al Kafri for his support and encouragement which were so important for completing my study.

My appreciation and gratitude are also extended to all staff members and my colleagues at the Faculty of Environment and Engineering at Northumbria University, and to those who helped me by discussing different ideas of this research.

Of course, these acknowledgements would not be complete without encouragement and goodwill of my parents, my wife, my children and all of my family.

Finally, I wish to thank everyone who has, in some way or another, helped me, even if with a kind word.

Declaration

I declare that the work in this thesis has not been submitted for any other award and it is my own work. The ideas and contributions of other people have been acknowledged throughout this thesis.

Name: Turki Alshadadi

Signature:

Date:

Chapter One: Introduction

Disasters are an increasingly important topic as there is growing evidence from EM-DAT¹ records that disasters are increasing in frequency and scale. Fortunately, the loss of life caused by disasters has decreased, but the cost of damage has increased. According to the data of EM-DAT, 2495 out of the 6,457 disasters in the world affected Asia between 1995 and 2015, which is greater than any other continent.

The Kingdom of Saudi Arabia, which is a part of Asia, is prone to many natural disasters. For example, earthquakes and volcanic hazards might occur in the northwestern region, while floods are likely to occur during heavy rainfall in the central and western regions. The southwest region is exposed to landslides, whereas shifting sand and sand storms are common natural hazards in the central and eastern regions of the kingdom (Al-Bassam et al., 2014). In the last two decades, there has been a considerable increase in weather-related natural disasters, especially floods, in the Kingdom of Saudi Arabia (Alshehri et al., 2013).

The Kingdom of Saudi Arabia has the political will to mitigate the risks of disasters, but it has been very slow in developing policies and plans that deal with natural disasters in the kingdom (Abosuliman et al., 2013). The current efforts in disaster risk reduction tend to be reactive rather than proactive. These efforts have not been successful as initially hoped.

Few studies about disaster risk reduction in the kingdom have focused on applying policies and plans which are based on non-cultural factors. This study focuses on the assessment of natural disasters, particularly the role of Islamic teachings in mitigating the risks of natural disasters in the Kingdom of Saudi Arabia.

1.1 Background of the Study

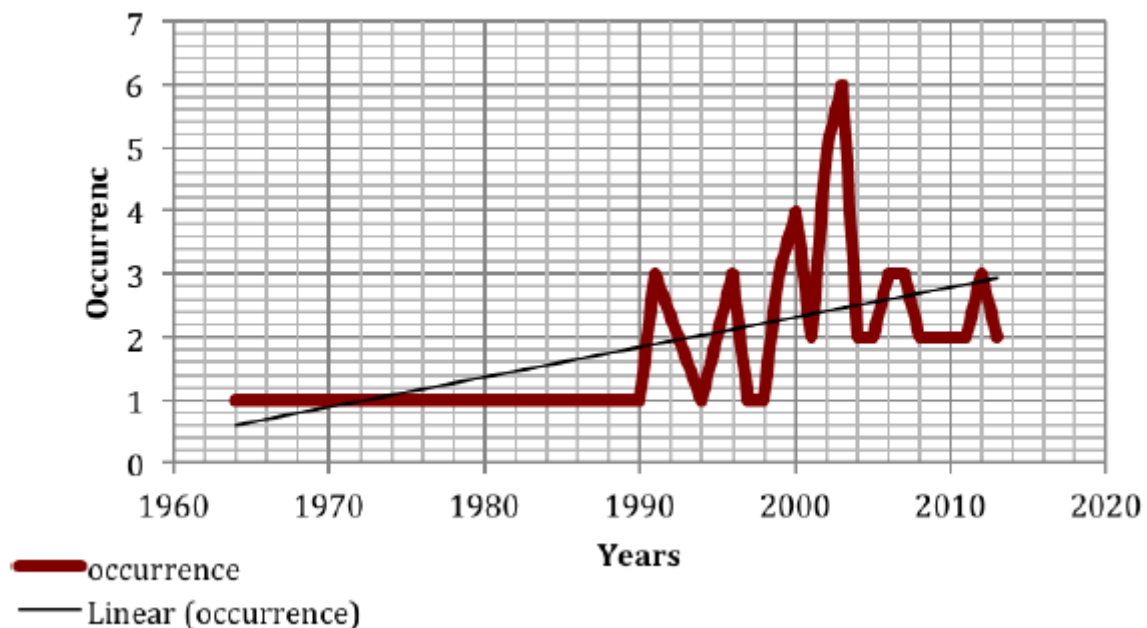
The Kingdom of Saudi Arabia, which is an Asian country located in the Arabian Peninsula, has witnessed different types of man-made and weather related natural disasters. The latter represents around 70% of the disasters that occurred in the kingdom between 2000 and 2010 (Alshehri, 2015). An increasing population, an expanding economy and the use of advanced technology in Saudi Arabia have created greater need for the use of coastal and inland areas.

¹ The International Disaster Database- Centre for Research on the Epidemiology of Disasters

Nevertheless, these improvements in technology and industry are leading to a greater risk of natural, terrestrial and marine disasters. The current rates of growth also show that the frequency of natural hazards will increase considerably in the future. Recent figures already confirm that there is a worrying rise in losses from geological and weather-related disasters. According to UNISDR (2009) disasters occur when events overwhelm the capacity to cope. This is the general definition of disasters, but more definitions will be discussed in Section 2.2.1. Disasters lead to high costs in terms of lives lost and damage to property (Pararas-Carayannis, (2013). In the Kingdom of Saudi Arabia the lack of planning to combine social and economic factors in developments has made the kingdom especially vulnerable (Pararas-Carayannis, (2013).

The rate of disasters, especially floods, has increased in recent years in the Kingdom of Saudi Arabia, as is shown in Figure 1.1, which sends warning alarms to the Saudi authorities to take serious actions for disaster risk reduction.

Figure 1.1: The rate of disaster occurrence in the Kingdom of Saudi Arabia (Alshehri, 2015: 6)



As is shown in Figure 1.1, there has been a gradual increase in the occurrence of disasters between 1990 and 2010, with the peak between 2000 and 2005. This rate, especially floods,

has dramatically increased in the last five years in different parts of the Kingdom of Saudi Arabia.

1.2 Problem Definition

Consecutive Saudi governments have made many efforts locally, regionally and globally to reduce the risks of disasters, especially natural disasters. Most of the studies and governmental efforts have focused on applying policies and plans which are based on non-cultural factors, such as modern technology. However, cultural knowledge plays an important role in disaster risk reduction (Kulatunga, 2010). Some researchers say that cultural factors and knowledge considerably influence the behaviour of people who face natural disasters (Oliver-Smith, 1996).

One of the important cultural factors that play an important role in disaster risk reduction is religion. Gaillard and Texier (2010) explain that religion has an important role in disaster risk reduction because religion always interacts with economic, social and political constraints in the construction of people's vulnerability in the face of natural hazards. Ager et al. (2015) also explain that local faith communities have a vital role in disaster risk reduction because they can use their premises and existing strong social relations and networks with the community to coordinate, mobilize, console, help and encourage to mitigate the devastating effects of natural disasters.

As discussed by Paradise (2005) and Azim and Islam (2016) in the literature review, the role of religion in disaster risk reduction is worthy of an in-depth study in the Arab World, especially in the Kingdom of Saudi Arabia where religion is the cornerstone in people's daily life and in any process of decision making at the governmental level. Therefore, this study addresses the issue of the role of Islamic teachings in the perception and preparedness for disaster risk reduction in the Kingdom of Saudi Arabia.

1.3 Research Importance

Since disaster awareness and preparedness are two important parameters that can help mitigate the impact of future disasters in the Kingdom and different areas in Saudi Arabia are vulnerable to a range of hazards, each community must assess its own vulnerability and risks and develop

specific strategies. Effective disaster mitigation requires the assumption of greater responsibility by individuals, groups, organizations and government agencies.

Because of different discourses over how to manage weather-related disasters, we need critical approaches from the perspective of cultural values, social settings and power structures that shape discourses and actions in relation to this type of disasters. In this regard, the Saudi Government has not benefited from the Islamic perception and the role of Islam to face weather related natural disasters. Therefore, the views of Islam on natural disasters need to be incorporated into the planning disaster risk reduction in the Kingdom of Saudi Arabia.

This research analyses disaster vulnerability in Saudi Arabia to identify the most appropriate interventions required by disaster community including government, community and stakeholders to make communities more resilient and better able to cope with weather related natural disasters, especially floods. This study focuses on the potential impacts of weather-related natural disasters in Saudi Arabia and how the role of Islam in disaster risk reduction can be incorporated into the planning disaster risk reduction in the Kingdom of Saudi Arabia.

1.4 Research Aims and Objectives

The aim of the research is to evaluate current approaches to disaster risk reduction in the Kingdom of Saudi Arabia and examine the actual and potential role of Islamic teaching in the perception and reduction of the risks of natural disasters. The research has the following objectives:

- 1- To investigate the perception and preparedness Saudi citizens to face weather related natural disasters in the Kingdom of Saudi Arabia
- 2- To analyse the efforts of the Kingdom of Saudi Arabia in disaster risk reduction
- 3- To evaluate the concept of natural disasters in Islam
- 4- To investigate the role of Islam in disaster risk reduction
- 5- To make recommendations to incorporate Islamic teachings into the policies and strategies of disaster risk reduction in the Kingdom of Saudi Arabia

The research uses a mixed methods approach to address the aims and objectives.

1.5 Research Questions

The key research questions that are addressed in this study are:

- 1- How do Saudi people understand and prepare to face natural disasters in the Kingdom of Saudi Arabia?
- 2- How has the Kingdom of Saudi Arabia responded to weather related disasters in the kingdom?
- 3- What is the Islamic concept of natural disasters?
- 4- What is the role of Islamic culture in disaster risk reductions?
- 5- How Islamic teachings can be incorporated to policies and strategies to reduce natural disaster risks in the Kingdom of Saudi Arabia?

1.6 Research Journey

The focus of the researcher in the M.Sc. program was on man-made disasters and their impacts on both the natural environment and people. In particular, the focus of the research was on investigating the causes of petroleum pollution in the western coastal area of the Kingdom of Saudi Arabia. The researcher started to notice a considerable increase in the number of natural disaster, especially floods, in the Kingdom of Saudi Arabia. Therefore, at the beginning of the Ph.D. program, the researcher focused on natural disasters in the Kingdom of Saudi Arabia and how to reduce their risks. The initial Ph.D. research question was how Saudi Arabia tackle natural hazards and prepare to reduce their risks. So, the main interest was how to raise people's awareness about natural hazards.

At this stage of research, the focus was not on one particular natural hazard, but on multiple natural hazards such as floods, earthquakes, dust storms and heat waves. The researcher found that the Kingdom of Saudi Arabia has witnessed a rapid economic development at different levels in the last fifty years, and this rapid economic development was accompanied by a high demand for foreign workers and a rapid process of urbanization. These two particular factors made the Kingdom of Saudi Arabia vulnerable to many natural hazards because the infrastructure in the host cities was not built to accommodate a dramatic increase in the number of its residents. The new residents of the host cities started to live in areas which are vulnerable to floods and other natural hazards. The focus on vulnerability rather than the hazard events themselves increasingly became the key question.

The researcher moved to investigate the efforts and role of the Saudi government in DRR. The Saudi government was found to have a political will to mitigate the risks of natural disasters. There is a national plan to be applied by different parties in the kingdom when disasters occur. However, the efforts of the kingdom were found to be reactive rather than proactive in Disaster Risk Reduction. Moreover, the focus of the plan was institutional more than focusing on communities themselves.

When the researcher met people to investigate Saudis' perception of natural disasters, it was found that Saudi people were enthusiastic to be active in disaster risk reduction. However, they lacked knowledge and information about natural disasters in their areas. When the researcher began to ask people what they thought would be a good way, the idea of the mosque and the importance of it pointed to cultural factors in disaster risk reduction. Therefore, the researcher began to investigate the role Islam and Islamic teachings in the perception of natural disasters and disaster risk reduction. Through data collection and analysis, the researcher found that Islamic teachings encourages a proactive view of natural disasters and DRR can be done successfully using the mosque and Islamic teachings in the Kingdom of Saudi Arabia. This directly contradicts "common sense" notion that Islamic culture is fatalistic.

1.7 Thesis Structure

This thesis addresses the role of Islamic teachings in the perception and preparedness to face the risks of weather related natural disasters in the Kingdom of Saudi Arabia. The thesis consists of eight chapters. The first four chapters are a general background and review of the literature related to the study.

Chapter One is a short introduction to the study. It presents a general introduction that includes general background for the study, research problem, research importance, aims and objectives and research questions.

Chapter Two is a review of the hazard material. It shows the conceptual terminology in the difference between, hazards, risks and disasters. It also presents an overview of the development of the paradigms of hazards, starting with a single hazard and developing into resilience. It also discusses the two main types of disasters: natural and man-made. The different impacts of disasters are also discussed in this chapter.

Chapter Three is a discussion of the relation between disasters, Islam and science. This chapter discusses the relation between faiths, in particular Islam, and weather related natural disasters. This chapter presents a discussion of hazards in Islam; there is a discussion of the Islamic views on the environment and natural disasters, the issue of disaster risk reduction in Islam and the role of the mosque in disaster risk reduction. Previous studies on disaster risk reduction in Muslim communities are also discussed in this chapter. The chapter concludes with clarifying the misconception of the conflict between Islam and science with regards to weather related natural disasters.

Chapter Four is a discussion of hazards and vulnerability in the Kingdom of Saudi Arabia. First, it presents an overview of the Kingdom of Saudi Arabia and general information about the culture and traditions in the kingdom. Second, the two main types of hazards, natural and man-made, are discussed with an overview of the different hazards that occurred in the Kingdom of Saudi Arabia from the past to the present. Third, vulnerability in the kingdom and the efforts of disaster risk reduction are discussed, with particular reference to the local, regional and global efforts of the Kingdom of Saudi Arabia in disaster risk reduction.

Chapter Five is an overview of the methodology used in this study. Research philosophy, research ethics and research approaches are discussed, and a qualitative approach was felt to be the best approach to study the role of Islamic teachings in the perception and preparedness to face the risks of weather related natural disasters in the Kingdom of Saudi Arabia. The design of this study is discussed in this chapter in terms of sampling, data collection methods, reliability of the research tools, procedure of data collection and scoring and analysis.

Chapter Six presents the results obtained from this research. Results of the questionnaire are presented first according to three variables: overall, gender and province. Then, results of the interview and focus group are presented.

Chapter Seven is a discussion of the findings of this study. The discussion addresses the main research questions according to the findings of this study in the light of the previous research about the role of religion in disaster risk reduction. The discussion agrees with previous research that people in Saudi Arabia lack vital information about disaster risk reduction in terms of perception and preparedness, but Saudi people are enthusiastic to be involved in disaster risk reduction process in the Kingdom. The discussion of the results also showed that the teachings of Islam are proactive in facing the risks of weather related natural disasters. The misconception between Islamic teachings and science with regards to natural disasters is also clarified in this chapter, showing that both science and Islamic teachings agree on natural disaster risk reduction. Based on the discussion of the results of this study, suggestions and recommendations are proposed to integrate the Islamic teachings into the policies and strategies of disaster risk reduction in the Kingdom of Saudi Arabia.

Chapter Eight is the general conclusion of this study. It summarizes the general findings of this study and recommendations for further research about the role of Islamic teachings in disaster risk reduction. Limitations of this study are also presented to be avoided in future research.

Chapter Two: Literature Review of Hazards and Disasters

2.1 Introduction

Earthquakes, tsunamis, hurricanes, volcanic eruptions, floods and droughts have always been part of the environment. However, the number of natural disasters have recently increased dramatically. The number of natural disasters that occurred in the world in the last five years is considerably higher than the number of natural disasters that took place in the 1990s (Magrabi, 2011). Consequently, such disasters have had devastating socio-economic and geopolitic impacts worldwide, especially in the developing poor countries. In the last 20 years, for example, disaster have caused 3 million deaths, damaged the lives of over 820 million people and caused more than \$100 billion in property damage (Pararas-Carayannis, 2013). In response to the risks of disasters, different parties around the world, such as the United Nations, national governmental and non-governmental organizations and academic institutions, has started to work hard to achieve an effective progress in the strategies and policies of disaster risk reduction.

A general review of the literature of natural disasters show that the literature is very fragmented. Different theories and theoretical foundation have been used in the literature by different researchers and scholars. This chapter discusses natural disasters. Therefore, the differences between the terminology used to describe natural disasters and risk are clarified in this chapter, and then the different forms of the two main types of disasters, namely natural and man-made disasters, are discussed. Second, the chronological development and changes in disaster paradigms are discussed starting from a single event such as a flood and then moving to multiple disasters and vulnerability of human beings. This is followed by a discussion of the different impacts of disasters on the life of living creatures. In particular, socio-economic impacts and psychological impacts are discussed in this chapter.

2.2 Conceptual Terminology

It is important to clarify the common terminological overlap which is usually found when discussing disasters, risk and hazards. Quarantelli (1998: xiii) stresses that “a developing field [of research] will flounder unless there emerges some rough consensus about its central concept(s).” This section presents the definitions of these terms and highlights differences between them.

2.2.1 Disaster

There is little or no agreement on the definition of disasters amongst researchers working in the disaster (Smith, 2001). Many terms have been used in the literature to describe disasters such as catastrophe, cataclysm and calamity (Zenklusen, 2007). In this thesis, the term disaster will be used.

Blaikie et al. (1994: 21) say, “A disaster occurs when a significant number of vulnerable people experience a hazard.” A disaster was defined by Gunn (1992) as an ecological breakdown in the relationship between people and their nature. In Gunn’s definition, the surprise factor of a disaster and the need for extraordinary procedures to cope are highlighted. Disasters usually lead to negative impacts that depend on many factors such as nature of the disaster, the extent of vulnerability and preparedness to cope with disasters. This can be seen in the definition proposed by Benson and Clay (2004: 5) who see a disaster as the “occurrence of an abnormal or infrequent hazard that affects vulnerable communities or geographic areas, causing substantial damage, disruption and perhaps casualties, and leaving the affected communities unable to function normally.”

From a social perspective, disasters were defined in terms of their social features and effects on the life of human beings. For example, Perry (2005: 313) points out “the definition of disasters as social events, acknowledgment that disasters are disruptive to social intercourse, and that disaster should be understood in a context of social change/human and institutional adaptability.” Pelanda (1982) focuses on three dimensions in defining disaster: causal, descriptive and normative. In the causal dimension, disasters are seen as a result of negative environmental and social influences. In the case of the descriptive dimension, the whole community will be stressed when a disaster happen. This collective stress is natural especially when we talk about the normative dimension where there is a contradiction between the destructive impacts of disasters and the ability of people to cope with the disruption.

One way to address the conceptual overlap in the definition of disasters is, as suggested by Porfiriev (1998: 56), dependent on the research methodology and methods adopted by the researcher:

The *research methodology and methods* of the two different types of studies on conceptualizing and defining disaster should also be expected to be quite different. The conceptual-focused ones would involve generic-type complex approaches and theories (system, sociological, linguistic, information, risk, multi-criteria decision-making in conditions of uncertainty) reflecting both objective and subjective (perceptual) aspects of disaster. At the same time, a pragmatic-oriented study would rather apply common sense, as well as widely known intuitive and simple logic approaches based on a limited number of objective criteria.

Blaikie et al's (1994) definition that related disasters to the vulnerability of people to hazards will be adopted in this thesis to describe weather related natural disasters.

United Nations International Strategy for Disaster Reduction (UNISDR, 2009: 9) defines a disaster as, “a serious disruption of the functioning of a community or society involving widespread human, material, economic, or environmental losses and impacts, which exceeds the ability of affected community or society to cope using its own resources.”

There is difficulty in exactly knowing in quantitative terms the number of disasters. The two most important sources of information are the UN and insurance industry. An academic overview is provided by the epidemiology department of De Louvain University in Belgium. Table 2.1 in Section 2.3 will present a classification of disasters according to size and the degree of impact, response, procedures, resources and public involvement.

2.2.2 Risk

Risk in general can be defined as the probability of harm. Such harm can affect anything related to risk. In the case of disasters, risk can be defined as the possibility of harm due to a variety of hazard events such as damage in the environment, injuries, death, economic crisis and destruction of livelihood (ISDR, 2002). All in all, elements that can be subject to risk are divided into three main categories: humans, economy and geography.

Kelman (2003) considers disaster risk as multidisciplinary which can be used in a variety of situations. Helm (1996) defines risk as the possibility of occurrence of an event with negative

consequences. Tobin and Montz (1997) relate the probability of risk to the occurrence of vulnerability, which in turn leads to unexpected loss. Similarly, Blaikie et al (1994) see risk as a result of the interplay between hazard and vulnerability. In any case, the definition of risk depends on the one who observes it. There is no general agreement on the definition of risk, but there is a common ground in the definition of risk. That is, the incapability of man to cope with the situation of risk which exposes people to a variety of dangers (Hewitt, 1997).

2.2.3 Hazards

A hazard can be defined as a potential risk which threatens human life, health, property or the environment. If this risk becomes an actual incident, then it is called an emergency or a crisis. If it causes overwhelming and destructive damage, then it is considered a disaster.

A hazard can be generally defined as a threat which denotes a future risk and may have negative impacts on all the parties involved. Burton and Kates (1964: 413) defined hazards as “Those elements of the physical environment, harmful to man and caused by forces extraneous to him.” UNISDR (2009: 17) defines hazard as, “a dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.”

2.3 Types of Disasters

There is no general agreement on how many types of disasters exist. That is why different types of disasters have been discussed in literature (Shaluf, 2007). For example, Hood et al. (1992) discuss three types of disasters; purely natural disasters which are caused by unforeseen reasons and beyond the control of man.; hybrid disasters which are both natural and man-made; and purely social disasters which result from decisions taken by people and their organizations. Similarly, Turner and Pidgeon (1997) classify disasters into natural and man-made where the former refers to disasters that happen beneath or above the surface of earth, in addition to metrological and biological disasters. The latter, on the other hand, refers to disasters caused by wars or accidents. Shaluf (2007) categorized disasters into three types: natural, man-made and hybrid. In the report of World Health Organization (2003), disasters are classified into two types: natural and man-made disasters.

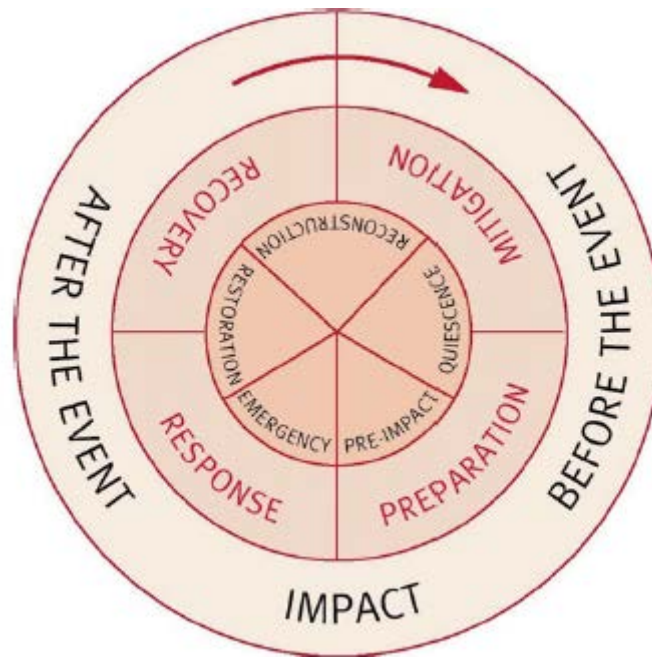
Glade and Alexander (2013: 78) defined disasters as “the coping capacities of the affected individual, group or unit (local, regional or national governments, public institutions, social groups, etc.) are exceeded and external support is likely to be required.” Based on this definition Glade and Alexander divided disasters according to the magnitude of emergencies and contingencies upon ability of people to respond to and cope with events of different sizes. Table 2.1 shows the classification of natural disasters according to size and the degree of impact, response, procedures, resources and public involvement.

Table 2.1: A size classification of emergencies and contingencies (Glade and Alexander, 2013: 79)

	Incidents	Major incidents	Disasters	Catastrophes
Impact	Very localized	Generally localized	Widespread and severe	Extremely large
Response	Local efforts	Some mutual assistance	Intergovernmental response	Major international Response
Plans and procedures	Standard operating procedures	Emergency plans activated	Emergency plans fully activated	Plans potentially Overwhelmed
Resources	Local resources	Some outside assistance	Interregional transfer of resources	Local resources Overwhelmed
Public involvement	Very little involvement	Mainly not involved	Public very involved	Extensively involved
Recovery	Very few challenges	Few challenges	Major challenges	Massive challenges

In their classification, the speed of onset and duration of events are important factors in dividing disasters. For example, a flood is a sudden-impact disaster while drought or soil erosion takes a long time to happen. Another important criterion for dividing natural disasters, according to Glade and Alexander (2013), is recurrence interval and regularity. Many phenomena which are caused by human activity are non-recurrent, such as transportation crashes, but a large number of extreme natural phenomena is repetitive. However, the regularity of natural disasters depends on the origin and the type of disaster (Glade and Alexander, 2013). In this regard, the majority of metrological and hydrological events are regular, which requires a disaster cycle to be tackled. In all cases of disasters, the mitigation, preparation, impact and response to disasters depend on the size of the disaster. Such cyclical relation is illustrated in Figure 2.1.

Figure 2.1: The disaster cycle (Glade and Alexander, 2013: 81)



As can be seen from Figure 2.1, before a disaster planners and officials will be busy in preparation and mitigation of possible disasters. Once a disaster occurs, it will have destructive impacts on society so planners and officials will focus on response to the disaster and quick recovery. In this cycle, there will be certain values and beliefs before the disaster, which will be challenged by an emergency that requires huge efforts for restoration to the normal life. Such an experience will trigger reconstruction of the previous values and beliefs to come back to quiescence, which will be challenged again by a new emergency.

Burton and Kates (1964) classified natural hazards according to their principle and causal agent into different kinds.

Table 2.2: Common natural hazards by principal causal agent (Burton and Kates, 1964: 415).

Geophysical		Biological	
Climatic and metrological	Geological and geomorphic	Floral	Faunal
Blizzards and snow	avalanches	Fungal diseases	Bacterial and viral diseases
Droughts	Earthquakes	<i>For example:</i>	<i>For example:</i>
Floods	Erosion (including soil erosion and shore and beach erosion)	<i>Athlete's foot</i>	<i>Influenza</i>
		<i>Dutch elm</i>	<i>Malaria</i>
		<i>Wheat stem rust</i>	<i>Typhus</i>
Fog	Landslides	<i>Blister rust</i>	<i>Bubonic Plague</i>
Frost	Shifting sand		<i>Venereal Disease</i>
Hailstorms	Tsunamis	Infestations	<i>Rabies</i>
Heat waves	Volcanic eruptions		<i>Hoof and Mouth Disease</i>
Hurricanes		<i>For example:</i>	<i>Tobacco Mosaic</i>
		<i>Weeds</i>	
		<i>Phreatophytes</i>	
		<i>Water Hyacinth</i>	
Lightening strokes and fires			Infestations
			<i>For example:</i>
Tornadoes			<i>Rabbits</i>
		Hay Fever	<i>Termites</i>
		Poison Ivy	<i>Locusts</i>
			<i>Grasshoppers</i>
			Venomous Animal Bites

As can be seen from Table 2.2, the two main categories of natural hazards are geophysical and biological. Geophysical natural hazards fall into two subcategories: climatic/metrological and geological/geomorphic. The first subcategory, climatic and metrological natural hazards, refers to blizzards, snow, droughts, floods, fog, forest, hailstorms, heatwaves, hurricanes, lightening

strokes/fires and tornadoes. The second subcategory, geological and geomorphic natural hazards, refers to avalanches, earthquakes, erosion, landslides, shifting sand, tsunamis and volcanic eruptions.

Biological natural hazards also fall into two subcategories: floral and faunal. Floral hazards can be in the form of fungal diseases, infestations, hay fever and poison ivy. Faunal hazards can be in the form of bacterial diseases, viral diseases, infestations and venomous animal bites. This study focuses on weather-related natural hazards. Disasters will be classified in this thesis into two types: man-made and natural.

2.3.1 Man-Made Hazards

Man-made disasters refer to a large number of events that results from a variety of reasons such as ignorance, accidents, negligence or human design (Koerner, 2007). Such disasters usually lead to considerable loss of lives and damage to assets. For example, the bombings of 9/11 in the USA led to the loss in the lives of hundreds of innocent people and financial loss caused by the destruction of the twin towers.

Sawada et al (2011) points out that there are two types of man-made disasters: economic crisis and violence. The former includes currency crisis, hyperinflation, growth collapse and financial crisis. The latter, on the other hand, refers to different forms of violence such as wars, riots and terrorism.

2.3.2 Weather-related Natural Disasters

The focus of this research is on weather-related disasters which might occur in the Kingdom of Saudi Arabia. Therefore, the discussion in this section will focus on weather-related disasters only.

Engeström (1995) defines a natural disaster as a result of an abnormal event in nature, such as a flood, an earthquake or volcanoes and that event leads to extreme destruction and disruptions to the socio-economic processes of human beings. The impacts of a natural disaster are complex and depend on a variety of factors including the severity of the hazard or phenomenon

and the capability of the human being to cope with and respond to disruptions. In the recent past, there have been four major natural disasters; the Indonesian tsunami (2004), hurricane Katrina (2005), the Haiti earthquake (2010) and Tōhoku Tsunami in Japan (2011).

According to Swada et al (2011) natural disasters can be divided into four kinds: biological disasters, geophysical, hydrological and meteorological. Biological disasters refer to disasters which usually happen when natural organisms are exposed to toxic materials and germs. Biological disasters include epidemics, insect infestation and animal stampede. The epidemic category refers to various kinds of infections such as viral infection, fungal infection, prion infections, parasitic infections and bacterial infections (Jha et al, 2010).

Jha et al (2010) define geophysical disasters as events that happen in the Earth's crust. For example, earthquakes are caused by movements within the upper layer of the earth which causes vibrations and destruction. Jha et al (2010) categorized geophysical disasters into different types such as earthquakes, volcano and dry mass movements (rock fall, land slide, avalanche and subsidence).

Hydrological disasters refer to "Events caused by deviations in the normal water cycle and/or overflow of bodies of water caused by wind" (Jha et al, 2010: 340). Hydrological disasters are divided into two main categories: floods and mass wet movement. Floods can be storm or coastal floods, while mass wet movements, similar to geophysical categories, have many subcategories such as rock fall, land slide, avalanche and subsidence.

Metrological disasters are a major category of natural disasters and cause some 70% of disaster losses (Feng, 2010). The destructive effects of metrological disaster are increasing and in the developed world can cause major and costly damage to buildings and infrastructure. Jha et al (2010: 340) define meteorological disasters as "events caused by short-lived/small to meso-scale atmospheric processes (in the spectrum from minutes to days)." This category of disasters is divided into different subcategories: windstorms (cyclones, typhoons, and hurricanes), tornadoes, hailstorms, snowstorms, sea surges, floods, droughts and heat waves/cold waves (Shaluf, 2007).

2.3.2.1 Windstorms

If the wind is very fast and not caused by tornadoes or hurricanes, it is called a windstorm. Windstorms are generally generated by thunderstorms, low pressure centres or air flow over mountains (Changnon, 2010). Different types of damage can be caused by strong winds such as damage to aircraft, homes, vehicles, trains, trees and transmission lines. For example, the total damage caused by windstorms in the United States of America over the past 46 years was estimated to be \$ 379 million and it was considered to be the sixth higher weather loss (Changnon, 2010).

2.3.2.2 Tornadoes

Etkin, Higuchi and Platsis (2012: 234) define a tornado as “a dangerous, rapidly rotating column of air, usually associated with supercell thunderstorms.” Tornadoes might appear transparent or opaque as can pick up dust and debris. A tornado can move very fast in any direction, reaching a speed over 200 mph (Levitan, 2011). Etkin, Higuchi and Platsis (2012) divided the damage caused by tornadoes into six categories depending on the severity of damage:

- Category F0: Light damage with wind less than 73 mph.
- Category F1: Moderate damage winds between 73 mph to 112 mph.
- Category F2: Considerable damage with winds between 113 mph to 157 mph.
- Category F3: Severe damage with winds between 158 mph to 206 mph.
- Category F4: Devastating damage with winds between 207 mph to 260 mph.
- Category F5: Incredible damage with winds above 260 mph.

2.3.2.3 Hailstorms

Hailstorms which come from thunderstorms are a hot season phenomena. Hail occurs when a very cooled droplet of water collects a number of layers of ice until it reaches a size where updrafting air cannot support its weight and it falls to the ground (Etkin, 2010). Generally, hailstorms cause damage to the transportation systems, properties, agriculture and livestock. The strongest hailstorm recorded was in Coffeyville, Kansas in (1970) where hail was found to be between 14 cm and 44cm in diameter and weighing up to 766 g (Etkin and Brun, 1999).

2.3.2.4 Sea Surges

A sea surge is a rise in the level of sea which has negative effects depending on the timescale and the magnitude of sea rise (Ullmann et al, 2007). Some of the negative impacts that can be caused by sea surges are coastal erosion and floods. Pirazzoli and Tomasin (2002) point out that sea surges can be caused by many factors such as river flooding, atmospheric storms, coastal geomorphologic evolutions and isostasy.

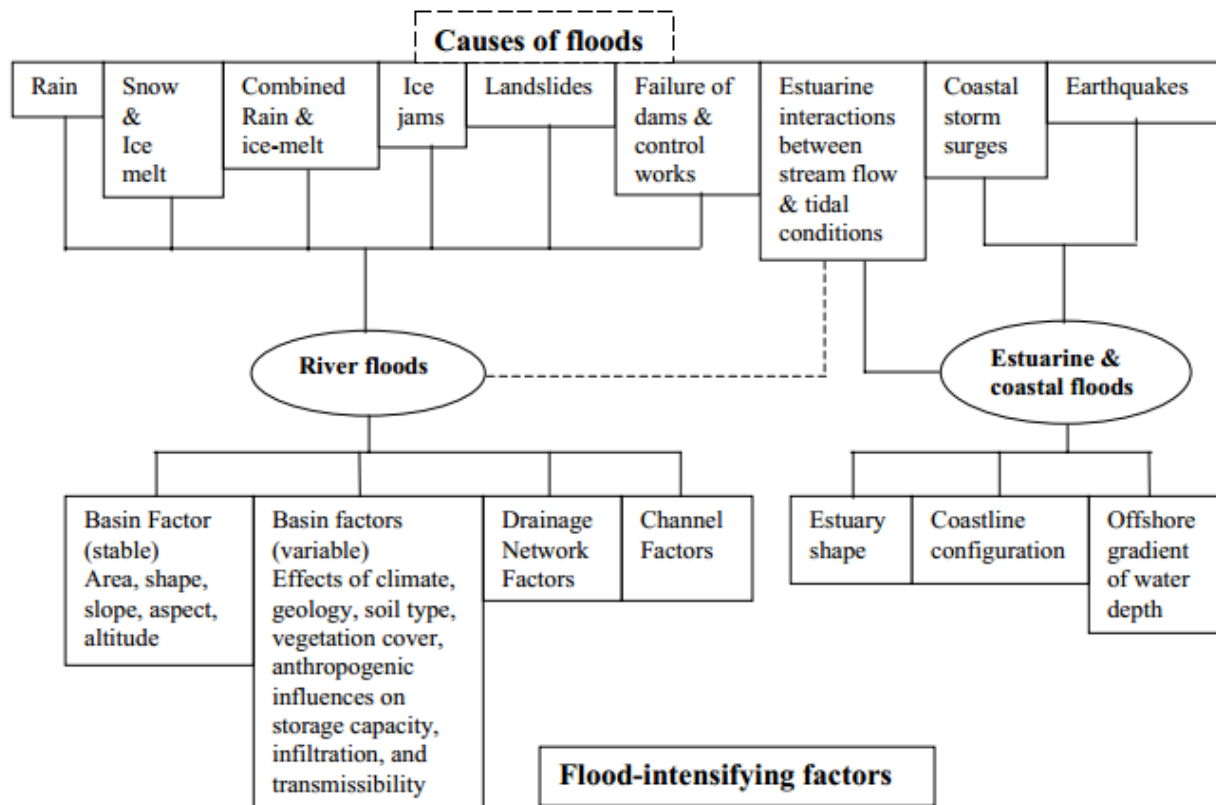
2.3.2.5 Floods

As is often said, flood is too much water in the wrong place. Etkin et al. (2010: 49) define flood as the “result when natural or man-made channel courses cannot carry all the water supplied to them or when drainage is blocked by the formation of some natural dam.”

Viglione et al. (2010) refer to three processes that generate floods: channel processes, coastal processes and catchment processes. Channel processes include dam breaks and ice jams, while coastal processes include high sea levels and storminess; catchment processes, in turn, include catchment saturation, snowmelt and intense rainfall. Miller and Miller (2000) also explain that a flood happens when the level of water in a channel exceeds the width of the channel. Importantly, the duration of a flood depends not the amount of water in a stream but also on the gradient of water in that stream.

Smith and Ward (1998) presented a detailed explanation of the causes of flood as is shown in Figure 2.2.

Figure 2.2: Causes of flood (Smith and Ward, 1998: 11)

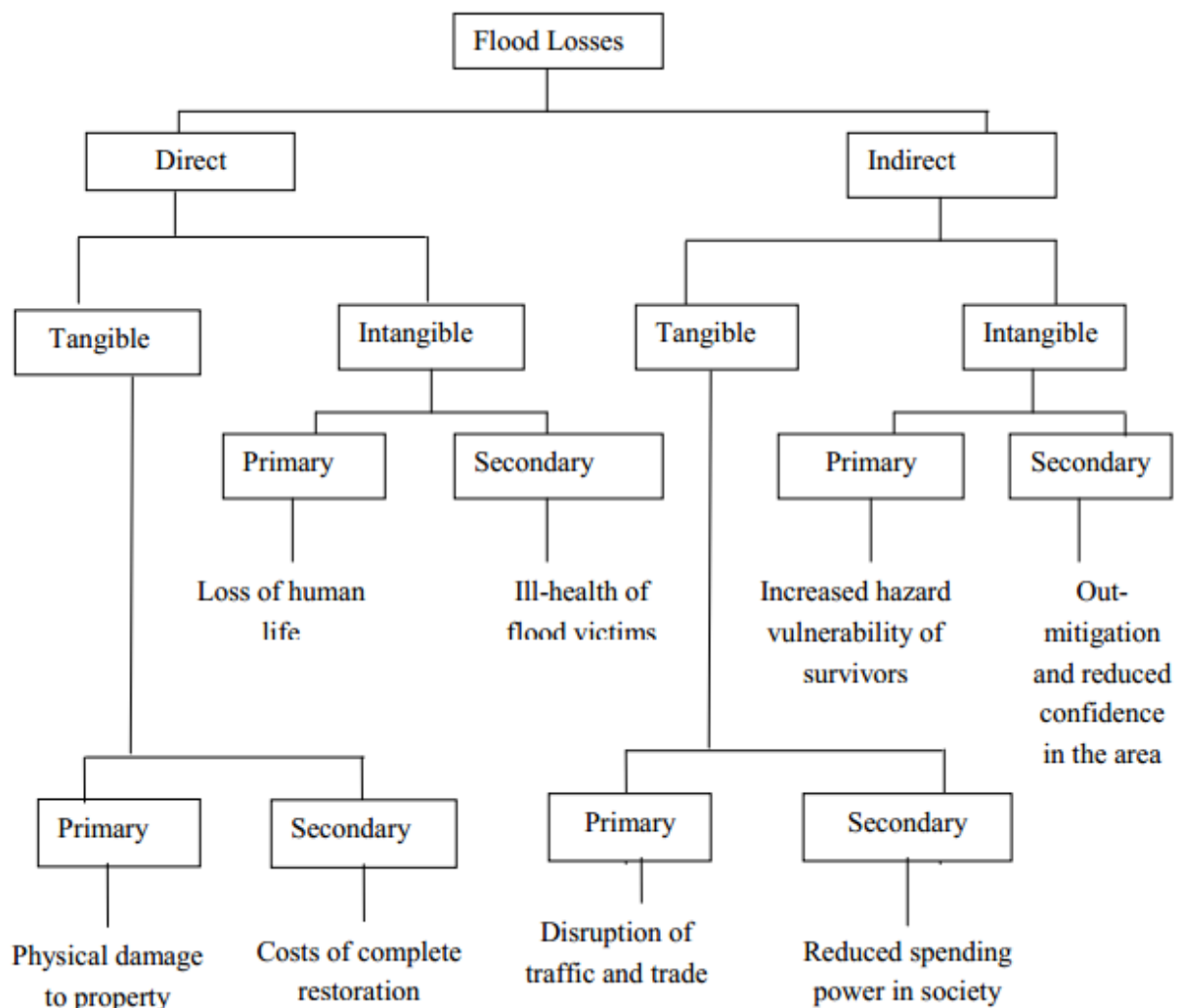


As shown in the Figure 2.2, there are two types of floods: river floods and estuarine and coastal floods. River floods can result from heavy rain, heavy snow and ice-melting combined rain and ice-melt, ice jams, landslides and failure of dams and control works. Some factors that can intensify river floods are; stable basin factors such as area, shape, slope, aspect and attitude; variable basin factors such as effects of climate, geology, soil types, vegetation cover, anthropogenic influences on storage capacity, infiltration and transmissibility. Estuarine and coastal floods, on the other hand, are caused by factors such as earthquakes, costal storm surges and estuarine interactions between stream flow and tidal conditions. Estuarine and coastal floods can also be intensified by some factors such as estuary shape, coastline configuration and offshore gradient of water depth. Such detailed modelling, as in Figure 2.2, does not exist for other hazards.

Flood is one of the most dangerous disasters because it has more negative impacts than other disasters. Blaikie et al. (1994) explain that the danger of flood is not restricted to drowning and

injury, but it also related to some other dangerous phenomena such as famine and diseases. Smith and Ward (1998) presented detailed classification of the impacts of floods:

Figure 2.3: The categories of flood loss potential (Smith and Ward, 1998: 34)



As is shown in Figure 2.3 the impacts of floods are divided into two categories: direct and indirect. Each category is also sub-divided into tangible and intangible categories (primary and secondary). Smith and Ward (1998) explain that direct losses occur immediately after the flood. Direct categories are divided into tangible and intangible categories. The direct tangible primary category is related to the physical damage to the property, while the direct tangible secondary category is related to the costs of complete restoration. The direct intangible primary category, on the other hand, is related to the loss of human life, while direct intangible secondary category is related to the health of food victims.

In contrast to direct categories, Smith and Ward (1998) point out indirect losses usually occur after the flood has receded. Indirect categories are divided into tangible primary and secondary categories and intangible primary and secondary categories. The indirect tangible primary category is related to disruption in traffic and trade, while the indirect tangible secondary category is related to reduced spending power in the community. Indirect intangible primary category is related to the increased hazard vulnerability of the survivors, while the indirect intangible secondary category is related to out-migration and reduced confidence in the area.

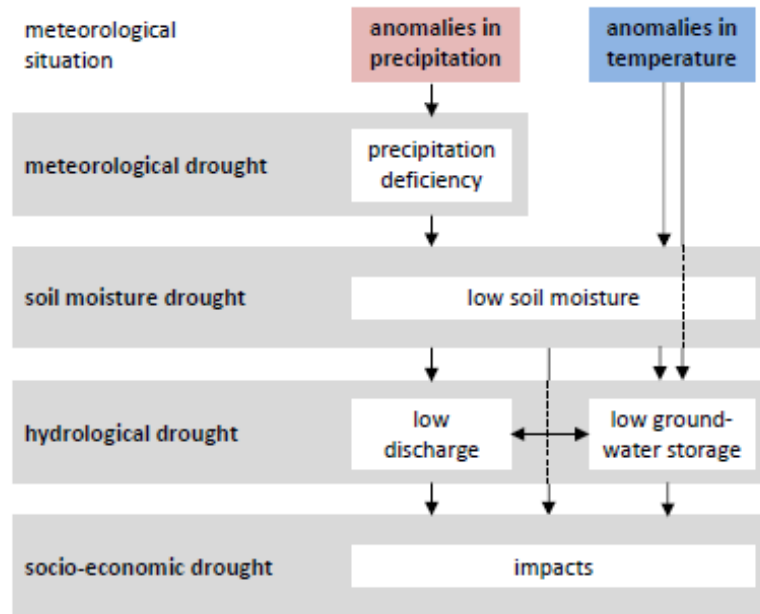
2.3.2.6 Drought

Drought is a natural hazard that occurs when there is a shortage of water, especially when there has been little or no precipitation for a long period of time. It can also occur when there are higher temperatures than normal in a region because more water will be evaporated, or delay in the start of the rainy season (Wilhite and Glantz, 1985 cited in Institute of Food and Agricultural Sciences, 1998: 729- 730). Wilhite and Glantz (1985) propose four different definitions for drought which correspond to different categories of drought:

- Metrological drought: it is usually measured by how far from normal the precipitation has been over some period of time.
- Agricultural drought occurs when there is not enough soil moisture to meet the needs of a particular crop at a particular time.
- Hydrological drought refers to deficiencies in surface and subsurface water supplies. It is measured as streamflow and as lake, reservoir and ground water levels.
- Socioeconomic drought is what happens when physical water shortage starts to affect people, individually and collectively.

These four categories of drought are illustrated in Figure 2.4.

Figure 2.4: Scheme representing drought propagation (Loon et al. 2014: 10504)



Loon et al. (2014) explain that the social-economic impacts of drought are not directly related to the meteorological drought, because they are indirectly related to hydrological drought and soil moisture drought. In this regard, Loon et al. (2014: 10468) say that knowledge of the causes of hydrological drought, which are low discharge and low ground-water storage, is very important for an effective management of drought. Loon (2015: 359) defined hydrological drought as the “lack of water in the hydrological system, manifesting itself in abnormally low streamflow in rivers and abnormally low levels in lakes, reservoirs, and groundwater.”

2.3.2.7 Heat and Cold Waves

A heat wave can be generally defined as abnormally high temperature that can last for a minimum period of two days (Koppe et al. 2004). A specific definition of a heat wave depends on the aim and purpose of the study (Pascal et al., 2013). For example, if the aim of the study is a preventive plan to avoid the effects of a heat wave, then the definition of heat wave depends on forecasted data to expect the heatwave and issue a warning. The effects a heat wave can have on people varies according to their adaptability. However, it can have serious effects on vulnerable people at risk such as the elderly, children or people with certain medical conditions (Matzarakis et al., 2011).

Similar to heatwaves, a cold wave can be generally defined as abnormally low temperature. Cold waves can have dangerous effects on public health, especially deaths from respiratory and cardiovascular diseases (Barnett et al., 2012).

2.3.2.8 Dust Storms

Dust storms are generally caused by turbulent winds which carry large quantities of sands and dust to distant areas and regions (Miller et al., 2008). In some cases, dust can pass thousands of kilometres to be deposited by dry and wet processes. For example, a huge dust storm happened in Rub Al Khali in Saudi Arabia and carried large quantities of dust to the Emirates, Bahrain, Qatar, Syria, Iraq and the southern borders of Iran (O'Hara et al., 2006). Saharan dust may reach North America by way of the Pacific (McKendry et al., 2007).

The study of dust storms is important because of their relation to the earth system. The following are some of the many effects reported by researchers:

- Loadings of dust may influence temperatures through scattering and absorbing solar radiation (Toon, 2003).
- Dust may impact the levels of sulphur dioxide in the atmosphere by heterogeneous reactions or physical absorption ((Adams et al., 2005).
- Loadings of dust may affect the primary productivity of marine systems (Ridgwell, 2003).

Dust storms in the Middle East are known by the Arabic word “Haboob” which means ‘strong wind.’ (Miller et al., 2008). Haboob refers to any kind of huge dust storm regardless of its mechanism. Figure 2.5 shows a haboob in the Kingdom of Saudi Arabia.

Figure 2.5: Haboob in KSA



(source: <http://news.blogs.cnn.com/2012/04/16/gotta-watch-extreme-sand-and-dust-storms/>)

2.4 Impacts of Disasters

Disasters can have many impacts on the both the physical and natural worlds. These impacts can be summarized as economic, social and psychological impacts. This following section discusses the variety of disaster impacts.

2.4.1 Economic and Social Impacts

Disasters impact on the economy of a country in a number of ways. Some researchers have claimed that natural disasters can have a positive effect on the economy of a country. For example, the gross domestic product (GDP) in a country rises immediately after a natural disaster as money is spent on reconstruction (Albala-Bertrand, 1993; Otero and Marti, 1995; Dacy and Kunreuther, 1969; West and Lenze, 1994)

However, other researchers say that this increase is temporary and natural disasters, especially large disasters, have negative impacts on the economic growth of a country (Raddatz, 2007; Noy, 2009; Raddatz, 2009; Loayza, *et al.*, 2009; Fomby *et al.*, 2009; Hochchrainer, 2009). For example, disasters have considerable impacts on the infrastructure of a country (housing, roads, telecommunications, utilities and others), which leads to to impacts on economic activities such as employment, production, income and inflation (Cavallo and Noy, 2010). Benson and Clay

(2004: 1-3) explain that "natural disasters can and do have severe negative short-run economic impacts" and that there may be "adverse longer-term consequences for economic growth, development and poverty reduction." For example, The World Disasters Report (IFRC, 2002) states that a natural disaster can wipe out the long-process of development in a country in just a few hours. Therefore, the affected country should modify its investment programs (long-term effects) and economic policies (short-term effects).

Benson and Clay (2004) also point out different types of disasters have different impacts on the economy of the country. For example, meteorological disasters, which are very frequent, usually have wide negative impacts on the agriculture of the country. On the other hand, geophysical disasters, which are less frequent, usually have negative localized effects, for example damage to infrastructure.

Economic impacts of natural disasters are interconnected with social impacts. Kahn (2005) explains that the death toll of natural disasters in developing countries is much higher than industrialized countries because the former is ill-prepared for disasters while the latter is well-prepared. Similarly, Wildavsky (1988) argues that increased income usually means increased safety and preparation for natural disasters. Burton, *et al.* (1993) adds that there is a reverse relation between vulnerability and income. In other words, increased income means lower vulnerability and vice versa. The majority of people in developed countries have insurance schemes, better building construction and advanced weather and seismic monitoring devices. Moreover, some people in developing countries live in vulnerable and isolated areas, which makes it very difficult to reach the affected people.

In short, natural disasters might have negative impacts on the short-term economic performance of a country and long-term development of the affected country. Increased social impacts are also observed in developing countries where many poor people are vulnerable to disasters.

2.4.2 Psychological Impacts

Disasters, in psychology, are seen as mass traumatic events that affect many people (Sandhu and Kaur, 2013). People who are affected by disasters are called victims. There are different

kinds of victims in disasters such as those who were injured, those who escaped death, family-members of the deceased and those who witnessed the disaster.

Sandhu and Kaur (2013) mentioned many psychological impacts for natural disasters. These impacts are peri-traumatic stress reactions, post-traumatic stress disorder (PTSD), complicated grief symptoms, depression, anxiety disorder, substance abuse disorders, distorted perceptions, pessimism and a tendency towards suicide. In some cases, people do commit suicide. The most common mental health disorders that occur after disasters are PTSD, depression, and generalized anxiety disorder (Meewisse et al., 2011; Norris et al., 2002).

The prevalence of PTSD was generally found to be 30 –40 per cent of directly impacted disaster victims. The psychological impact of disaster varies according to the type of disaster, with the lowest prevalence in natural disasters and the highest in man-made disasters (Neria et al., 2008).

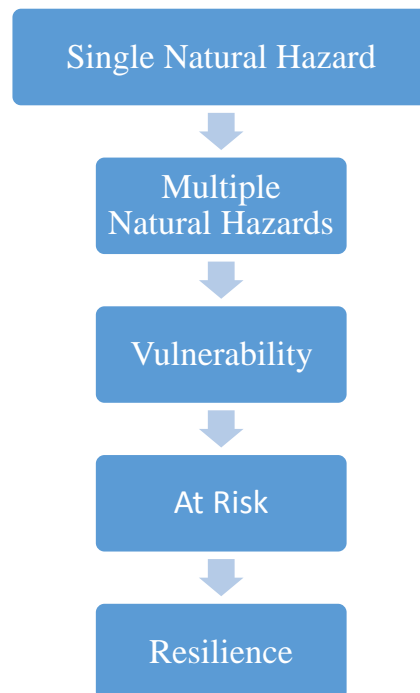
The psychological impacts of natural disasters on the health of survivors can be detrimental as survivors might resort to self-medication with drugs or alcohol before they seek assistance from health providers. If the survivors already have mental health problems, they might increase the use of health facilities due to physical or psychological reasons (Den Ouden et al., 2007; Olteanu et al., 2011; Van der Velden et al., 2006). Such people are the most vulnerable to the psychological impacts of natural disasters because there will be disruption in usual health care, medication access, routine/support, and living environment (Horan et al., 2007).

The psychological impacts of natural disasters vary according to the age of the affected people. Children, particularly young children, are vulnerable and might suffer short- and long-term mental health problems throughout the disaster. Though teenagers are more developed and resilient than children, they are still suffer different mental health impacts because of loss of friends, community and possessions (Crane and Clements, 2005). As for older people, they can be the most vulnerable to the psychological impacts of natural disasters because of the difficulty in their evacuation, disruption of the daily routine, high risk of physical injury, loss of economic resources, delay in recovery, relocation, limited financial resources and replacement in possessions/housing and residing in a nursing home (Brown, 2007).

2.5 Development of the Concept of Natural Hazards

The first research interest in natural hazards started in economic geography rather than cultural geography (O’Keefe, 2017). The concept of natural hazard has developed from the focus on one single natural hazard, namely flood, and passed through different stages which are multiple hazards, vulnerability, at risk and resilience, as is shown in Figure 2.6. This section reviews these stages in the development of the concept of natural hazards.

Figure 2.6: Evolution of Paradigm of Natural Hazards (Source: author)



As is shown in Figure 2.6, the first interest in natural hazards started in the 1930s. Carr (1932) associated the term ‘disaster’ with human and economic loss so he said that “not every windstorm, earth-tremor, or rush of water is a catastrophe” (Carr, 1932: 211). In other words, Carr argued that we only have a catastrophe when there is human loss. White (1935) discussed the effect of water on the lives of human beings. Later on in 1936, White evaluated the different methods and potential benefits of protection against floods. Flood has then become the main concern in the studies of White who is known as “The Father of Floodplain Management”.

The focus of White in his early studies was on one natural hazard, namely flood, and the mechanism of this hazard. That is, what causes floods, how do they happen and how we can

alleviate it? White (1945: 2) described floods as the "...acts of God, but flood losses are largely acts of man. Human encroachment upon the flood plains of rivers accounts for the high annual total of flood losses." The main focus of White (1945) was on seven protective procedures to alleviate the destructive effects of floods; these procedures are:

- 1- elevating land
- 2- watershed treatment
- 3- use of levees and dams
- 4- providing emergency warning and evacuation
- 5- making structural changes in buildings and transportation
- 6- changing land use to reduce vulnerability
- 7- taking out insurance

In the 1960s, the focus shifted from the mechanism of natural hazards to multiple hazards and the relationship between nature and man. For example, Burton and Kates (1964: 413) focused on multiple natural hazards where they defined natural hazards as "Natural hazards are those elements in the physical environment, harmful to man and caused by forces extraneous to him."

Similarly, Burton et al. (1968) discussed multiple natural hazards, permanent settlement in hazardous areas and the intervention of man to manipulate nature by using his powers. Human action does cause new hazards, especially technological intervention, and has started to find natural limits. These limitations, according to Burton et al., originate from a variety of factors such as personality, nature, society and culture. Burton et al. (1968: 6) studied this relationship with the focus on the following aims:

- 1- Assessment of the extent of human occupancy by hazard zones.
- 2- Identification of the full range of possible human adjustments to the hazard.
- 3- Study of how man perceives and estimates the occurrence of hazard.
- 4- Description of the process of adoption of damage-reducing adjustments in their social context.
- 5- Estimation of the optimal set of adjustments in terms of anticipated social consequences.

O’Keefe and Westgate (1977: 26) defined the relationship between a disaster and people by saying that “without people, there is no disaster.” O’Keefe et al. (1976) argued that climatological and geological changes had been constant, but the destructive effects of disasters had been on increase. O’Keefe et al. (1976) attributed the considerable increase of destructive effects to the vulnerability of human beings to extreme natural events. They argued that the suffering caused in disasters were usually the highest in poor countries, because of the lack of development and preparation to mitigate the effects of such disasters. Torry (1979) also attributed disasters to land-use practices which can expose vulnerable people to flooding, droughts, blight and frost. This argument is also supported by Cannon (1994) who explains that hazards might be natural but disasters are not because they are usually generated by social processes which expose some human beings to risk more than others. Therefore, the vulnerable social and economic situation of man can be a serious cause of disasters, which are no longer seen as solely ‘Acts of God’.

From the 70s to the 90s, as is shown above, the concept of vulnerability has become very important in the discussions of disaster risk reduction. The reason behind the increasing interest in vulnerability is that natural hazards should look in the light of the political and economic circumstances of society. For example, many poor people live in vulnerable areas such as volcanic zones, flood zones or slopes, which makes such people vulnerable to natural hazards. If the economic situation of such people was different, the effects of natural hazards could be mitigated.

Many definitions have been proposed by different scholars and researchers to define vulnerability. Table 2.3 presents a summary of some of these definitions which emphasize the human element, not the environmental element.

Table 2.3: Definitions of vulnerability (O'Brien and O'Keefe, 2014)

Author	Definition
Timmerman (1981)	Vulnerability is the degree to which a system acts adversely to the occurrence of a hazardous event. The degree and quality of the adverse reaction are conditioned by a system's resilience (a measure of the system's capacity to absorb and recover from the event)
Susman <i>et al.</i> (1983)	Vulnerability is the degree to which different classes of society are differentially at risk
Bogard (1989)	Vulnerability is operationally defined as the inability to take effective measures to insure against losses. When applied to individuals, vulnerability is a consequence of the impossibility or improbability of effective mitigation and is a function of our ability to detect hazards
Mitchell (1989)	Vulnerability is the potential for loss
Liverman (1990)	Distinguishes between vulnerability as a biophysical condition and vulnerability as defined by political, social and economic conditions of society. She argues for vulnerability in geographic space (where vulnerable people and places are located) and vulnerability in social space (who in that place is vulnerable)
Downing (1991)	Vulnerability has three connotations: it refers to a consequence (e.g. famine) rather than a cause (e.g. drought); it implies an adverse consequence (e.g., maize yields are sensitive to drought; households are vulnerable to hunger); and it is a relative term that differentiates among socioeconomic groups or regions, rather than an absolute measure or deprivation
UNDRO (1991)	Vulnerability is the degree of the loss to a given element or set of elements at risk resulting from the occurrence of a natural phenomenon of a given magnitude and expressed on a scale from 0 (no damage) to 1 (total loss). In lay terms, it means the degree to which individual, family, community, class or region is at risk from suffering a sudden and serious misfortune following an extreme natural event
Dow (1992)	Vulnerability is the differential capacity of groups and individuals to deal with hazards, based on their positions within physical and social worlds
Smith (1992)	Human sensitivity to environmental hazards represents a combination of physical exposure and human vulnerability \pm the breadth of social and economic tolerance available at the same site
Alexander (1993)	Human vulnerability is function of the costs and benefits of inhabiting areas at risk from natural disaster
Cutter (1993)	Vulnerability is the likelihood that an individual or group will be exposed to and adversely affected by a hazard. It is the interaction of the

	hazard of place (risk and mitigation) with the social profile of communities
Watts and Bohle (1993)	Vulnerability is defined in terms of exposure, capacity and potentiality. Accordingly, the prescriptive and normative response to vulnerability is to reduce exposure, enhance coping capacity, strengthen recovery potential and bolster damage control (i.e., minimize destructive consequences) via private and public means
Blaikie <i>et al.</i> (1994)	By vulnerability we mean the characteristics of a person or a group in terms of their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard. It involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or in society
Green <i>et al.</i> (1994)	Vulnerability to flood disruption is a product of dependence (the degree to which an activity requires a particular good as an input to function normally), transferability (the ability of an activity to respond to a disruptive threat by overcoming dependence either by deferring the activity in time, or by relocation, or by using substitutes), and susceptibility (the probability and extent to which the physical presence of flood water will affect inputs or outputs of an activity)
Bohle <i>et al.</i> (1994)	Vulnerability is best defined as an aggregate measure of human welfare that integrates environmental, social, economic and political exposure to a range of potential harmful perturbations. Vulnerability is a multilayered and multidimensional social space defined by the determinate, political, economic and institutional capabilities of people in specific places at specific times
Comfort <i>et al.</i> (1999)	Vulnerability are those circumstances that place people at risk while reducing their means of response or denying them available protection
Weichselgartner and Bertens (2000)	By vulnerability we mean the condition of a given area with respect to hazard, exposure, preparedness, prevention, and response characteristics to cope with specific natural hazards. It is a measure of capability of this set of elements to withstand events of a certain physical character

As can be seen from these definitions, vulnerability is mainly about the exposure of man to risks due to socio-economic or environmental factors.

In order to manage vulnerability effectively, it is very important to understand it. That is, we need to know how vulnerability is generated, how it increases and builds up (Cardona, 2011). Bankoff (2004) explains that people are not at risk because they are exposed to hazards, but because of access to resources, everyday patterns of social interaction and organizations. Thus,

people are vulnerable to disasters as a result of complex interaction conditions and drivers. Cannon (2006) says that some global processes are important drivers in the creation of vulnerability. Some of these drivers are rapid and inappropriate urban development, population growth, failures in governance, social and economic inequalities, environmental degradation and world financial pressures.

In addition to drivers of vulnerability, it is important to understand the different dimensions of vulnerability, which is, as argued by Vogel and O'Brien (2004), multidimensional. Cardona et al (2012) discuss three main dimensions of vulnerability as is shown in Table 2.4.

Table 2.4: Dimension of vulnerability (adopted from Cardona et al, 2012)

Dimension	Explanation
Environmental	Environmental dimensions include potentially vulnerable natural systems (e.g., low-lying islands, coastal zones, mountain regions, drylands, and Small Island Developing States), impacts on systems (e.g., flooding of coastal cities and agricultural lands, or forced migration)), mechanisms causing impacts and responses or adaptations to environmental conditions
Social	The social dimension is multi-faceted and cross-cutting. It focuses primarily on aspects of societal organization and collective aspects rather than individuals.
Economic	Economic vulnerability can be understood as the susceptibility of an economic system, including public and private sectors, to potential (direct) disaster damage and loss and refers to the inability of affected individuals, communities, businesses, and governments to absorb or cushion the damage

Although different frameworks are used to define and understand vulnerability, Cardona et al (2012: 72) point out that some common factors about vulnerability have been identified:

- Susceptibility/fragility (in disaster risk management) or sensitivity (in climate change adaptation): physical predisposition of human beings, infrastructure, and environment to be affected by a dangerous phenomenon due to lack of resistance and predisposition of society and ecosystems to suffer harm as a consequence of intrinsic and context conditions making it plausible that such systems once impacted will collapse or experience major harm and damage due to the influence of a hazard event.
- Lack of resilience (in disaster risk management) or lack of coping and adaptive capacities (in climate change adaptation): limitations in access to and mobilization of the resources of the human beings and their institutions, and incapacity to

anticipate, adapt, and respond in absorbing the socio-ecological and economic impact.

In their book *At Risk* in 1994, Blaikie et al. focused not only on natural hazards but also on unnoticed events, hunger and diseases that pass by in our society, but such things put people's lives at risk. They started to look at risk from a broader perspective by studying the connection between risks, which threaten people, and the vulnerability of people to such risks. To know this connection, Blaikie et al. (1994) argued that the focus should not be on only natural hazards but also on social environment and its related processes. In this regards, Blaikie et al (1994: 5) say "The 'natural' and the 'human' are so inextricably bound together in almost all disaster situations, especially when viewed in an enlarged time and space framework, that disasters cannot be understood to be 'natural' in any straightforward way." However, Blaikie et al (1994) were criticised for a number of issues, such as the simplification of the mathematical risk function, lack of concentration on complex emergencies and technological hazards and absence of political economy (O'Keefe, 2017). In updated version of *At Risk* in 2003, Wisner et al proposed two analytical models to understand vulnerability in a better way. The first model connect root distant causes to unsafe conditions in the progress of vulnerability, while the second model benefits from some concepts, such as livelihood and access, to know why some people or communities are more vulnerable than others.

At this stage of disaster risk reduction, the international community started to focus on resilience. Resilience is derived from the Latin word *resilio*, meaning "to jump back" (Klein et al. 2003). Although the definition of resilience is still a matter of debate, Glade and Alexander (2013) says that resilience generally lies between the ability to resist and adapt.

Norris et al. (2008) explain that the resilience of a community relies on the access to a number of capacities such as social capital, income, community competence and economic development. If the members of a community do not have any help or assistance during disasters, it will be very difficult for them to recover from the negative impacts of the disaster and it will be very difficult for them to resist any future hazards. Lewis and Kelman (2010) point out that if the purpose is effective disaster risk reduction, then resilience programs should provide training to local communities to educate them about disasters and how they can mitigate them.

In their discussion of resilience and climate change, O'Brien and O'Keefe (2010) criticized the top-down strategies of governmental approaches where the focus is on building institutional resilience as opposed to community resilience. O'Brien and O'Keefe argue that bottom-up strategies are more effective in disaster risk reduction because local people who are vulnerable will be actively engaged in mitigating risk. Preparedness, self-help and resilience started to receive much greater attention at national and international levels because reducing the impacts of multi-dimensioned hazards in our life should go beyond the institutional level to the community level to make more effective multifaceted approaches (O'Brien and O'Keefe, 2010). Also, the focus on societal resilience in bottom-up approaches can effectively help to identify changes and the focus required in disaster risk reduction.

2.6 International Community Efforts in Disaster Risk Reduction

The noticeable increase in the number of crises and calamities around the world led to various international initiatives which aimed at reducing the risks of natural disasters. There has been a number of international initiatives in disaster risk reduction in the last two decades. These initiatives are: the International Decade for Natural Disaster Reduction (IDNDR), the United Nations' International Strategy for Disaster Reduction (UNISDR), Hyogo Framework for Action (HFA) and the Sendai Framework.

In the 1990s, the United Nations took action to reduce the effects of natural disasters. Following the resolutions 42/169 (1987) and 43/202 (1988), the Economic and Social Council of the United Nations developed a framework for international work and cooperation for International Decade for Natural Disaster Reduction (IDNDR) 1989/99. The main objective of this international cooperation was to show the political determination to use technological and scientific knowledge to reduce the effects of natural disasters, especially in developing countries. This decade had the following goals (IDNDR, 1989):

- (a) To improve the capacity of each country to mitigate the effects of natural disasters expeditiously and effectively.
- (b) To devise appropriate guidelines and strategies for applying existing scientific and technical knowledge, taking into account the cultural and economic diversity among nations.

- (c) To foster scientific and engineering endeavours aimed at closing critical gaps in knowledge in order to reduce loss of life and property.
- (d) To disseminate existing and new technical information related to measures for the assessment, prediction and mitigation of natural disasters.
- (e) To develop measures for the assessment, prediction, prevention and mitigation of natural disasters through programmes of technical assistance and technology transfer, demonstration projects, and education and training, tailored to specific disasters and locations, and to evaluate the effectiveness of those programmes.

National governments were encouraged to cooperate during the decade and develop national programs, use scientific knowledge and raise awareness of natural disasters to reduce negative effects on their people.

In 1994, member states in the UN met in Yokohama, Japan, to assess the mid-term progress of IDNDR. After reviewing the effectiveness of IDNDR until 1994, they found that although training, research and technical application in the first five years were successful in reducing some of the bad effects of natural disasters, awareness of the different benefits of disaster risk reduction had not reached decision makers in many countries. However, the organizational framework of the General Assembly, which included the National Decade Committees and Focal Points and the Special High Level Council, the Scientific and Technical Committee and the Decade secretariat, thought that the effort to date had been effective and decided to continue developing preventive measures and preparedness measures during the second half of IDNDR.

Participants in the meeting suggested a set of principles and strategies of action, with special focus on developing countries. Ten important principles were agreed in the meeting (World Conference on Natural Disaster Reduction, 1994: 8):

1. Risk assessment is a required step for the adoption of adequate and successful disaster reduction policies and measures.
2. Disaster prevention and preparedness are of primary importance in reducing the need for disaster relief.

3. Disaster prevention and preparedness should be considered integral aspects of development policy and planning at national, regional, bilateral, multilateral and international levels.
4. The development and strengthening of capacities to prevent, reduce and mitigate disasters is a top priority area to be addressed during the Decade.
5. Early warnings of impending disasters and their effective dissemination using telecommunications, including broadcast services, are key factors to successful disaster prevention and preparedness.
6. Preventive measures are most effective when they involve participation at all levels.
7. Vulnerability can be reduced by the application of proper design and patterns of development focused on target groups, by appropriate education and training of the whole community.
8. The international community accepts the need to share the necessary technology to prevent, reduce and mitigate disaster.
9. Environmental protection as a component of sustainable development consistent with poverty alleviation is imperative in the prevention and mitigation of natural disasters.
10. Each country bears the primary responsibility for protecting its people, infrastructure, and other national assets from the impact of natural disasters.

Participants in the Yokohama (1994) conference decided a plan of action at national, regional and international levels. Nationally, the governments of all countries were advised to be politically committed to protect their people from natural disasters by assigning national committees and designing national programs for risk assessment and reduction. In addition, non-governmental support and socioeconomic development planning should be incorporated into disaster reduction and prevention. Moreover, special attention should be given to raising public awareness of the benefits of disaster reduction by benefiting by use of education and media. Regionally, participants encouraged cooperation between regional centres in disaster reduction. This cooperation was in different forms such as exchange of information, mutual agreements and projects in disaster risk reduction and establishing regional early warning mechanisms for disaster risk reduction. Regional support, especially to developing countries, was seen as very important to focus on regions that have the same risk and help developing countries in reducing risk and achieving sustainable development. Internationally, bilateral and multilateral arrangements and cooperation was encouraged. The aims were achieved by

assigning extra budgetary resources and funds from multilateral financial institutions to reduce and prevent the risks of natural disasters. This fund and support was regulated through the Trust Fund for the Decade, which gave priority to the finance of the early warning systems for natural disasters, especially in the developing countries. In addition, exchange of information and expertise were encouraged to develop better indices of vulnerability and early warning systems of natural disasters.

Progress in the efforts of the United Nations for disaster reduction crystalized in the International Strategy for Disaster Reduction (UNISDR) in 2001. It is an action plan with a global framework to help people from all communities to become resilient against the impacts of all types of disasters. Different from previous efforts to reduce disasters, the focus here was more on disaster management rather than disaster response by integrating disaster reduction into the process of sustainable development. Importantly, the success of such a promising initiative depended on cooperation between the parties involved in disaster reduction: UN, media, national governments, non-governmental organizations and stakeholders in disaster risk reduction. UNISDR (2001: 4) aimed to achieve the following goals:

- 1- Increase public awareness about disaster reduction.
- 2- Obtain commitment from public authorities.
- 3- Stimulate inter-disciplinary and inter-sectoral partnerships.
- 4- Improve the scientific knowledge of the causes of natural disasters and the consequences of the impact of natural hazards.

UNISDR explained that the lack of knowledge amongst many decision makers was that they were more focused on disaster relief rather than disaster reduction. They did not have much information about the short-term socio-economic effects and long-term losses of disasters on vulnerable people who could be saved if the focus was on reduction rather than relief. Therefore, UNISDR (2001) stressed that the focus of decision makers should be on reducing natural disasters by dealing with vulnerability factors such as dependence on agriculture, deforestation, forced displacements and climate change. For instance, Humboldt Centre, a local community center in Nicaragua, followed a successful method to minimize the effects of natural disasters by studying soil factors in that area to decide the places where people can build house and live safely (UNISDR, 2001).

Following Yokohama (1994) and UNISDR (2001), UN focused on building the resilience of vulnerable people to face natural disasters which was the main topic of discussion in the World Conference on Disaster Reduction in Hyogo, Japan in 2005. The conference adopted the Hyogo Framework for Action 2005-2015 (HFA). HFA is characterized by a holistic strategic approach for disaster risk reduction which has focused not only on natural hazards but also their interaction and relation with related technological and environmental hazards.

HFA builds on the success that had been achieved since Yokohama Strategy (1994) in terms of lessons learned and identifies a number of gaps that need to be addressed. Some of these gaps are (HFA, 2005: 2):

- (a) Governance: organizational, legal and policy frameworks;
- (b) Risk identification, assessment, monitoring and early warning;
- (c) Knowledge management and education;
- (d) Reducing underlying risk factors;
- (e) Preparedness for effective response and recovery.

To address these gaps and achieve effective management of disaster risk reduction, HFA (2005: 3) focused on the following five main objectives:

- (a) To conclude and report on the review of the Yokohama Strategy and its Plan of Action, with a view to updating the guiding framework on disaster reduction for the twenty-first century;
- (b) To identify specific activities aimed at ensuring the implementation of relevant provisions of the Johannesburg Plan of Implementation of the World Summit on Sustainable Development on vulnerability, risk assessment and disaster management;
- (c) To share good practices and lessons learned to further disaster reduction within the context of attaining sustainable development, and to identify gaps and challenges;
- (d) To increase awareness of the importance of disaster reduction policies, thereby facilitating and promoting the implementation of those policies;
- (e) To increase the reliability and availability of appropriate disaster-related information to the public and disaster management agencies in all regions, as set out in relevant provisions of the Johannesburg Plan of Implementation.

HFA (2005: 6) focused on the following priorities to achieve its objectives:

1. Ensure that disaster risk reduction is a national and a local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety and resilience at all levels.
4. Reduce the underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.

After reviewing HFA in Sendai in Japan 2015, some gaps were identified such as lack of early warning systems in economic and social vulnerabilities and systematic assessment of multi-hazards. There was not also an effective implementation of the framework at the local level and disaster risk reduction was not adequately integrated into the national and international policies of sustainable development (UN ESCAP, 2011). Therefore, a new improved framework was launched and called the Sendai Framework. The priorities of the Sendai Framework for Disaster Risk Reduction are summarized as follows (WCDRR, 2015:9):-

1. Understanding disaster risk;
2. Strengthening disaster risk governance to manage disaster risk;
3. Investing in disaster risk reduction for resilience;
4. Enhancing disaster preparedness for effective response, and to “Build Back Better” in recovery, rehabilitation and reconstruction.

2.7 Summary

This chapter reviewed and discussed basic concepts, definitions and issues in natural disasters. The conceptual confusion in the terminology used in the literature of natural disasters was discussed in this chapter. The conceptual discussion of disasters, risks and hazards showed that literature is very fragmented and interdisciplinary so different definitions of these terms were used in different disciplines and settings. In this thesis, certain definitions were adopted to avoid conceptual confusion. For example, Blaikie et al (1994: 21) definition of disasters, which says, “A disaster occurs when a significant number of vulnerable people experience a hazard,” was adopted in this thesis. Although there has been no agreement in the literature on the definition of risk, the common ground in the definition of risk. which is the incapability of man to cope with the situation of risk which exposes people to a variety of dangers, was adopted

in this study. As for hazards, this thesis adopted the general definition which states that a hazard is a threat that denotes a future risk and may have negative impacts on all the parties involved. The two main types of hazards, natural and man-made, were discussed in this thesis. As was shown in the discussion, man-made disasters refer to a large number of events that results from a variety of reasons such as ignorance, accidents, negligence or human design. As for natural hazards, Engeström (1995) discussed them as abnormal events in nature, such as a flood, an earthquake or volcanoes and that event leads to extreme destruction and disruptions to the socio-economic processes of human beings. The impacts of a natural disaster were seen in this thesis as complex and depend on a variety of factors including the severity of the hazard or phenomenon and the capability of the human being to cope with and respond to disruptions. Overall, this thesis focused on three types of impacts: economic, social and psychological impacts.

This thesis also reviewed the development of the concept of natural hazard. The concept of natural hazard has developed from the focus on one single natural hazard, namely flood, and passed through different stages which are multiple hazards, vulnerability, at risk and resilience.

The focus of natural hazards developed from an academic debate to the main interest of institutional governance. This led to many international initiatives in disaster risk reduction, such as the International Decade for Natural Disaster Reduction (IDNDR), the United Nations' International Strategy for Disaster Reduction (UNISDR), Hyogo Framework for Action (HFA) and the Sendai Framework.

Chapter Three: Literature Review of Science, Islam and Environment

3.1 Introduction

The issue of environment and its protection is one of the central issues in the teachings of Islam. Muslims see the universe and everything in it, animate or inanimate, as a creation by God who orders people to keep balance in this universe or it will collapse. Therefore, God made man as His steward on earth to worship God and protect His creation, the universe. According to the teachings of the Holy Quran and the hadith of Prophet Mohammad (Peace be upon him), any destruction or change in the universal balance, which is created by God, is considered a sin in Islam. The Holy Quran “is the holy book for Muslims, revealed in stages to the Prophet Muhammad over 23 years. Qur'anic revelations are regarded by Muslims as the sacred word of God, intended to correct any errors in previous holy books such as the Old and New Testaments” (BBC, 2011). As for Hadith, or sometimes known as Sunnah, As-Sibâ’ee (2008: 73) defines hadith as “All that has been related from the prophet (Peace be upon him)- from his speech, actions, approvals, physical or moral attributes, or biography, regardless of whether of any of above is from the period before the first revelation or after it.” In Islam, any hadith reported ascribed to Prophet Mohammad (Peace be upon him) should satisfy very strict rules to be accepted as a true and authentic hadith said by Prophet Mohammad (Peace be upon him). All hadiths were reported by the companions of Prophet Mohammad (Peace be upon him). The Holy Quran and Hadith are just the two main sources of jurisprudence in Islam. The other two secondary sources are “the consensus of theologians (*ijma*) and juristic reasoning by analogy (*qiyas*)” (Moaddel and Talattof, 2000: 1).

This chapter discusses the Islamic view on environment and its protection. First, the importance of cultural knowledge, especially faith, for effective disaster risk reduction is discussed. It is shown that cultural knowledge plays a very important role in protecting people from the destructive effects of natural disasters. Then, the Islamic perspective on natural disasters is discussed in this chapter, with the emphasis on the three main explanations of natural disasters in Islam. The discussion shows that natural disasters are seen in Islam as a sign, a warning or punishment by God, because man destroyed the universal balance. As the mosque has a central role in the life of every Muslim, the potential roles of mosque in disaster risk reduction are discussed. The discussion shows that they had a very important role in the life of Muslims in

the past, where the mosque was considered as the headquarters for the daily guidance for every Muslim and taking very important decisions that decide peace and war in the life of Muslims. Previous studies on how Muslims perceive and interpret natural disasters are also reviewed, showing that the majority of Muslims supported the fatalistic view of natural disasters. However, this common view about natural disasters in Islam is challenged in this chapter showing a different look at natural disasters from an Islamic perspective.

Finally, this chapter tries to clarify the widespread misconception of contradiction between Islam and science; it explains the relationship between Islam and science, showing that Islam encourages science and makes the rank of scholars high in Islam.

3.2 Disaster and Culture

Culture is a complex term that has been defined differently by many researchers. Taylor (1924: 1) defined culture as the “complex whole which includes knowledge, belief, art, moral, law, custom and any other capabilities and habits acquired by man as a member of society.” Similarly, Schein (2004: 20) define culture as “a pattern of shared basic assumptions (beliefs) that was learned by a group as it solved its problems of external adoption and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way you perceive, think, and feel in relation to those problems.”

Cultural knowledge is very important for effective disaster risk reduction. The knowledge that a community has acquired through generations is one of the important sources on how to handle disasters (Kulatunga, 2010). For example, Arunotai (2008) points out that many of the local community during the Indian Ocean Tsunami in 2004 were successfully survived the natural disaster while many tourists and migrants were hugely affected. That is because local people have the cultural knowledge on how to deal with such disasters and they inherited this knowledge from their grandparents, while the tourists and migrants lack such knowledge. Anthropologists argue that cultural factors and knowledge has a considerable effect on the behaviour of people who face natural disasters (Oliver-Smith, 1996). Anthropologists explain that people sometimes do not consider the risks they might have during disasters, but they prioritize other economic and cultural factors, such as religion, social values, tradition and

intimate relation with the location. That is why some communities live in the slopes of active volcanoes or unstable areas that might have earthquakes.

Culture is divided into two main components: material and non-material culture. Kulatunga (2010: 306) explains the difference between the two by saying that “Material culture consists of physical or tangible creations that members of society make, use or share whereas nonmaterial culture consists of the abstracts and intangible human creations of society that influence people’s behaviour.” Some examples of the material culture, which we use to protect us against disasters, are houses, old buildings, agricultural production, crafts, clothes and locations. Non-material culture, in contrast, consists of values, beliefs, rules, language, networks, political systems and family patterns (Kendal, 2010). Kulatunga (2010) divides nonmaterial culture into four main components: symbols, language, values and norms. Kendal (2010) argues that belief is the most important components in nonmaterial culture, as it refers to the reality of certain things.

The relation between culture and religion has been discussed by many researchers. For example, Boyer (2003) says that religion is found in some way or another in all forms of culture. In studying the relation between religion and culture, Cohen (2009) found that religion can be conceptualized as an important specific form of cultural knowledge or it can be used to categorize cultural practices. Sasaki and Kim (2011) point out that religion has played a very important role in developing different cultures through ideologies and traditions, and culture play as a frame through which religion can be interpreted. As for the relationship between Islam and Arabic culture, especially in the Kingdom of Saudi Arabia, religion is seen as the most important component of the Arabic culture which is usually called the Islamic Culture.

Although cultural knowledge is very important for mitigating the risk of disasters, it has been ignored or neglected when the strategies of disaster risk reduction are planned or implemented (Wisner et al., 2004). Nunn et al. (2007) stress on the importance of cultural knowledge in disaster risk reduction because if such knowledge is neglected, it might lead to a dramatic increase in the vulnerability of the community to disasters, which will consequently hinder the successful implementation of the strategies and plans of disaster risk reduction. Likewise, Huntington (2000) says that cultural factors can be either a facilitator or a serious obstacle to the efforts of disaster risk reduction. After investigating case studies of different disasters and the relation of culture to face such disasters, Kulatunga (2010:311) suggested the following:

It is important to make the DRR strategies compatible with cultural aspects of the community in further strengthening community's coping capacity towards disasters. Further, the integration of local knowledge with appropriate scientific knowledge in an effective way to make the disaster affected communities resilient against natural disasters and their impacts also emphasised.

As belief or religion has a very important and central role in cultural knowledge, it plays an important role in disaster risk reduction. However, little research has been conducted on the influence of religion, especially Islam, on the perception of natural disasters and the serious impact of religion on the mitigation of the risks of natural disasters (Mitchell, 2000). Hutton and Haque (2003: 417) argue that the influence of religion on the perception and preparedness to face the risk of natural disasters is very important because “(...) without taking into account (...) socio-cultural beliefs, it is difficult to understand the manner in which the poor perceive and respond to natural hazards and disasters” (2003: 417). McGeehan (2014: 2017) also argues that:

The experience of the event is created by the people who have experienced it. Thus, whether or not one agrees with the content of the interpretation, it is an integral part of the disaster experience for the community, and therefore must be included as a legitimate factor in any attempt to increase disaster preparedness, cultivate hazard mitigation, build community resilience, and reduce disaster risk.

To bridge this gap in the literature, this study, as mentioned in Chapter One, aims to evaluate current approaches to disaster risk reduction in the Kingdom of Saudi Arabia and examine the actual and potential role of Islamic teaching in the perception and reduction of the risks of natural disasters. The following section will look in more details into the relationship between faith, in particular Islam, and natural disasters.

3.3 Natural Hazards and Faith

The connection between natural disasters, faith and punishment is not a new one. It goes back to the Greek, Roman and Egyptian civilizations when people used to worship different gods, such as the god of thunder, the god of earthquake and the god of flood, and these gods were believed to destroy people who disobey them (Ghafory- Ashtiany, 2015). Such thinking was supported and manipulated by people who used these misconceptions about gods to suppress people and threaten other people for their interest. In this regard, Ghafory- Ashtiany (2015: 374) says that “history is full of evidence that priests, religious leaders and rulers took

advantage of people's fears and consequently oppressed them in the name of a god or gods." People, at that time, had no choice but to trust the priests and religious leaders who used to ask them to please the gods by paying money and offering different kinds of food to be saved from natural disasters (Al Qamanny, 1999). Therefore, people used to interpret natural disasters in terms of superstitions, myth, magic and misconceptions, which made people think that little can be done to face natural disasters (Dhanhani, 2010).

Despite of the abundant knowledge and scientific development nowadays, man cannot prevent natural disasters, which makes some people believe in the misconceptions about gods and natural disasters. Rulers and religious leaders in some countries, especially the developing countries, always try to take the advantage of natural disasters in the name of religion (Dhanhani, 2010). For example, some natural disasters, such as the 2004 tsunami in Sri Lanka and the 2005 earthquake in Pakistan, were interpreted by Islamic scholars and leaders as the result of the spread of adultery, sins, corruption, disobedience to God and immorality in the Islamic countries. However, such interpretations of natural disasters "neglect the scientific evidence and awareness which suggests that much of the vulnerability that led to the terrible losses of lives and property was in large part a consequence of political, social and cultural factors." (Dhanhani, 2010: 62).

There has been an obvious lack of information about a theological analysis of disasters. This goes back to the abundant secular explanations which ascribe disasters to human vulnerability and/or features of de-moralised nature (Steinberg, 2000). In this regard, Alexander (2000: 186–7) stresses that "the repetitiveness of impacts and forms of damage, the deliberate or inadvertent creation of vulnerability, and the gross predictability of the consequences of disaster all add up to human, not supernatural, responsibility." Chester (2005) claims that theologians, in the past, kept silent on the issue of natural disasters and their causes, which were usually ascribed to divine punishment. All the attempts to explain natural disasters ended with the common conclusion that natural disasters are caused by the violation of the divine moral codes in the community (Philip, et al., 2004). However, such an explanation, according to Chester, is problematic, especially when innocent people suffer from natural disasters.

In different ancient deities, disasters were seen as a kind of punishment by nature's extremes to the guilty and sinful victims (Gaillard and Texier, 2010). For instance, the famines that appeared in Egypt and Palestine in the pre-Christian era were seen at that time as a punishment from God (Middleton and O'Keefe, 1998). In this regard, Grandjean et al. (2008:188):

History records many of these events; sometimes they seem to have overwhelmed ancient civilizations; always they became the stuff of myth and legend. These myths record not only the fact of the disaster, but also the human response to it _ the search for a reason: Why did it happen? In Antiquity, where civilizations were crucially grounded on belief in God or in gods, disaster was likely to be the expression of divine will: it was the wrath of the gods that caused the unleashing of some great affliction on man.

In this case, nothing will be done to prevent disasters and reduce their effects, except being submissive to your deity. Burton et al. (1993) say that this situation was very common in the pre-industrial societies in Europe in the Middle Age and currently in some of the developing countries. Similarly, this mentality of thinking was very common in Christianity in 1951 during the volcanic eruption in Mount Lamington in New Guinea (Keesing, 1952).

Hewitt (1983) claims that the conception of religion, according to the vulnerability paradigm, has the problem of ignoring other religions and focusing on one religion to explain the disaster. In this case, the diversity of religions is ignored to the preference of the dominant religion in the affected area. However, religion is an important part of the cultural context of the affected area, so it cannot be ignored as an important factor to help in the reduction of the effects of disasters. In this regard, Gaillard and Texier (2010:82) say "Religion can never be detached from the larger picture, as it always interacts with social, economic and political constraints in the construction of people's vulnerability in the face of natural hazards. People do not assess risk in simple terms, in terms of either the threat of hazard or religious and cultural filters." Ager et al. (2015) also explain that local faith communities have a vital role in disaster risk reduction because they can use their premises and existing strong social relations and networks with the community to coordinate, mobilize, console, help and encourage to mitigate the devastating effects of natural disasters. Similarly, Schipper (2010: 386) points out some of the important effects that religion or faith can have on the community and their perception and responds to hazards:

- Religion determines how people understand the causes of floods and droughts;
- Religion determines how people interact in society;
- Beliefs play out differently for different groups;
- Religion determines how empowered or vulnerable people feel with regard to hazards; and
- Religion is intertwined with political ideology.

When disasters happen, people resort to their religious, not civic, leaders. McGeehan (2014) explains that faith leaders can perform many important roles in disaster risk reduction. For example, faith leaders are usually the best to know the needs of vulnerable people such as elderly, children, women and people with special needs.

Since this research is about the role of Islam in disaster risk reduction, the focus will be on the Islamic perspective on hazards and disaster risk reduction.

3.4 Hazards and Islam

Muslims believe that God is the owner of everything in life, including animate and inanimate things. Everything is defined according to God, where everything in this universe follows His commands.

“He created everything and determined it most exactly” (25:2) and “It is He Who appointed the sun to give radiance and the moon to give light, assigning it in phases...Allah did not create these things except with truth. We make the signs clear for people who know” (10:5).

The actions of Man, according to Islam, are good when they follow God’s commands, while they are wrong when they contradict His commands:

“Let there be a community among you who call to the good, and enjoin the right and forbid wrong. They are the ones who have success” (3:104).

In this regard, Islam prescribes a code of behaviour in the life of Muslims, starting from his personal life to the relationship with the environment and other people (Khalid, 2002). It might

be thought that Islam is all about religious rituals and worship, but this common view is completely wrong because Islam is a way of life and covers all sides of life. For example, Ramli et al. (2014: 36) argue that “Safety management is a part of the sub-systems within the framework of a larger system: the system of Islam. This is because Islam is not just a ritual, but a comprehensive code of life. Moreover, all actions of Muslims are a form of worship if it fulfils the entire religious requirement, including the management of safety matters.”

The main sources of legislation in Islam are the Holy Quran and the sayings (Hadith) of Prophet Mohammad (Peace be upon him). In addition to the Holy Quran and Hadith, the agreement of Islamic scholars on some controversial issues, which are not clearly mentioned in the Holy Quran and Hadith, is considered as a secondary source of legislation.

The difference between different sects in Islam is mainly related to the different interpretations of the Holy Quran. Adiyoso and Kanegae (2013) explain that there are two different categories of interpretation of the Holy Quran. The first category is related to the ‘finite meaning’ while the second category is related to the ‘interpretable meaning,’ which is interpreted differently by different Islamic scholars. The problem here is which verses have ‘interpretable meaning’, and who can interpret these interpretable verses. In this regard, Adiyoso and Kanegae (2013: 921) argue that “human should interpret the meaning of language of merely based on the words stating in Holy Book, but it should be understood based on the social context when God’s messages transferred to the prophet.”

3.4.1 Islamic Views on the Environment and Natural Disasters

According to the teachings of the Holy Quran and the Sunnah (Sayings and teachings) of Prophet Mohammad (Peace be upon him), there are three central issues in the relationship between human beings and the environment. Bagader et al. (1994: 2) summarize these three issues as follows:

- 1- A relationship of mediation on, and consideration and contemplation of, the universe and what it contains
- 2- A relationship of sustainable utilization, development and employment for man’s benefit and the fulfillment of his interests

- 3- A relationship of care and nurture, for man's good works are not limited to the benefit of human species, but rather extended to the benefit of all created beings; and "there is a reward in doing good to every living thing."

The first relationship between human beings and the environment, as shown above, is a relation of contemplation and mediation. Natural environment is described in the Holy Quran as Ayat 'signs' about the greatness of the creator, God:

"Lo! In the creation of the heavens and the earth and in the difference of night and day are signs for men of understanding" (3:190).

Since nature is a sign about the greatness of God, it is created by measure, that is God:

"Verily, all things have We created by measure" (54:49).

Everything in this life is created by God in balance:

"And We have produced therein everything in balance." (Quran 55:7).

Islam sees nature as a sacred creation of God because He took oath by many of the natural phenomena:

"By the Sun and her brightness" (91:1); "By the Night when it enshroudeth" (92:1); "I swear by the planets" (81:15).

The headings of many chapters in the Holy Quran are also the names of natural phenomena such as 'Thunder', 'The Star', 'The Moon', 'The Sun', 'Dawn', 'Morning Hours', 'The Sand Dunes', 'Smoke', 'The Winnowing Winds', 'Iron', 'The Ants', 'The Bees', 'The Spider', 'Cattle', 'The Elephant' and 'The Fig'.

Therefore, man is required to look at the environment all around and think of the greatness of the creator who created everything by measure.

The second relationship between the human beings and the environment is a relation of utilization, benefit and development. God clearly mentioned in the Holy Quran that He created the earth and the environment for the benefit of human beings. He says:

“He who has spread out the earth for you and threaded roads for you therein and has sent down water from the sky: With it have we brought forth diverse kinds of vegetation” (20: 53)

As is shown in this verse, God created the earth and made different routes on it for the benefit of human beings. God also sends rain to the earth so that different kinds of plants grow for the benefit of human beings and other living creatures. God also says in the Holy Quran:

“And He has made the ships to be of service unto you, that they may sail the sea by His command, and the rivers He has made of service unto you. And He has made the sun and the moon, constant in their courses, to be of service unto you, and He has made of service unto you the night and day. And He gives you all you seek of Him: If you would count the bounty of God, you could never reckon it.” (14:32-34)

This holy verse shows that all the great things in our life, such as rivers, seas, the moon and the sun, were created and disciplined by God for the benefit of human beings, who can never count the blessings of God.

Prophet Mohammad (Peace be upon him) taught his companions and all Muslims to protect the life of plants and animals, economize in the consumption of natural resources to protect them for coming generations. For example, Prophet Mohammad (Peace be upon him) happened to pass by one of his companions, Sa'd, as he was performing ablution (wudhu). At this, the Prophet said:

"Sa'd what is this squandering?" Sa'd replied: "Can there be an idea of squandering (israf) in ablution?" The Prophet said: "Yes, even if you are by the side of a flowing river." Ibn Majah.

Even ablution is a requirement in Islam to perform any of the five daily prayers, Prophet Mohammad (Peace be upon him) advised people to economize in the use of water for ablution.

Economization in the use of water in ablution is very important in Islam even if there is too much water in the area, which means protecting and preserving natural resources is of vital importance in Islam irrespective of the purpose of use of such resources, religious or non-religious.

The prophet also advised Muslims to plant a tree even if it were the last second in your life:

“If the Hour (the day of Resurrection) is about to be established and one of you was holding a palm shoot, let him take advantage of even one second before the Hour is established to plant it” (Islamic Information Portal, 2011).

The third relationship between people and the environment is a relation of protection and conservation. God created people as a steward in this universe to manage it and keep the balance according to the commands of God. Prophet Mohammad (Peace be upon him) declared that:

“The world is beautiful and verdant, and verily God, be He exalted, has made you His stewards in it, and He sees how you acquit yourselves.” (Saheeh Muslim).

The conservation of the environment is a central issue in the teachings of Islam because God says in his Holy Quran that the creation of the natural order is greater than the creation of mankind:

“The creation of the heavens and the earth is far greater than the creation of mankind. But most of mankind do not know it” (Quran 40:57).

As is shown in this holy verse, God considers the creation of the universe greater than the creation of human beings. Therefore, if human beings spoil God’s great creation, which is the universe, they will have great punishment equal to the greatness of God’s creation of the universe.

Islam focuses on the idea that all the species in this universe should have equal access to natural resources, which were created by God for all of the species in this world:

“And He has set within it mountains standing firm, and blessed it, and ordained in it its diverse sustenance in four days, alike for all that seek.” (Quran 41:10).

This holy verse shows that God created natural resources and everything in the universe for the benefit of all creatures that need these resources, not only people. Therefore, people are required to access only their share and economize in the use of natural resources. Importantly, God obviously stated in the Holy Quran that people do not have the absolute freedom to spoil the balance created by Him on this earth:

“The sun and the moon follow a reckoning, / and the grass and the trees prostrate. / And He has raised the heaven and set up the balance, / [declaring] that you should not contravene with regard to the balance. / And observe the measure with justice and do not skimp the balance. / And the earth, He placed it for [all] creatures.” (55:5-10).

Therefore, a Muslim, according to the teachings of Islam, should protect the environment, protect natural resources and make them available to all people and other species.

Based on what is said above, the main Islamic perspective on the environment and people is that the creation of people is sacred but the creation of the universe and the environment is greater. God has created everything in this universe in balance and measure for the benefit of human beings and other species. People are required to benefit from the creation of God and preserve it for other generations and species. However, if someone does not follow the commands of God and protect His great creation, the universe, he will be punished, warned or sent an anger sign from God, as is explained below.

3.4.1.1 Disasters as Punishment

There are different views on the source of natural hazards. Many posit that processes in the earth's mantle and its atmosphere generate natural hazards that can lead to disasters. For those that think from a faith perspective often believe that natural disasters are a divine punishment from God on sinful people.

There is contradiction between the logical framework, which looks at natural disasters as natural results of natural processes, and the faith framework, which sometimes looks at natural disasters as divine punishment from God to sinful people. There are two views on natural disasters as punishment in Islam. The first common view is that natural disasters are seen as divine punishment for the sins committed by Muslims (Chester et al., 2012). For example, 1576 Earthquake in Cairo was seen by many Muslims as a divine punishment for the wide spread of coffee houses which disturbed Muslims from their worship to God (Akasoy, 2007). In such a case, Muslims have to go back to God, pray to Him and ask for forgiveness. Therefore, the fatalistic view is fully supported and people can do nothing to change or reduce the divine punishment. However, the 2005 Earthquake in Pakistan, which killed around 82000 people and deprived about 30 million people from their homes (World Health Organization, 2005), challenges this view because the earthquake took place in the holy month of Ramadan. As is known in Islam and reported by the Prophet Mohammad (peace be upon him), Raman is the holy month of forgiveness and mercy, so it is unlikely to be a divine punishment in the holy month of Ramadan (Brown, 2008). Muslims usually are very close to God and do extensive religious rituals during the holy month of Ramadan.

In the second view, in contrast, Islam considers that Allah created everything in our universe in measure, according to a balance. Based on this view, if people disturb this balance, they should be punished. In this regard, Islam considers natural disasters such as floods, sandstorms and earthquakes as a kind of punishment from God to the corruption of people on earth:

“Corruption has appeared on earth and at sea because of what the hands of men have wrought; in order that God may make them taste the consequences of their actions; so that they might return” (30:41).

The main rule in Islam is that any corruption on the earth is against the commands of God who does not like corrupters:

‘And do good as Allah has been good to you. Moreover, do not seek to cause corruption in the earth. Allah does not love the corrupters’ (Al- Qasas: 77).

Punishment in this sense is not just mere punishment, but it is a warning to mankind to fix their corruption. In this regard, Bin Muhammad et al. (2010: 31) say:

Our ‘hands’ have literally corrupted the ‘earth and sea’ and now we are to ‘taste’ the consequences of our actions, and those of our predecessors, not simply to be punished, but in order to be alerted to the need to return to God; not in order to become despondent, but on the contrary, more fervent in our resolve to put right what is wrong, and return to that natural equilibrium in which we were created.

If people not pay attention to their wrong deeds with nature and return to the natural balance, Allah mentioned many examples of people who were punished by natural disasters because of their bad deeds:

“So We seized each of them [the various wrongdoers mentioned in the preceding verses] for their sin: among them were those upon whom We unleashed a hurricane, and among them were those who were seized by the Cry, and among them were those whom We caused the earth to swallow, and among them were those whom We drowned. But it was not God who wronged them, but rather, it was they who wronged themselves.” (29:40)

When it comes to the Hadiths of Prophet Mohammad (peace be upon him), there are many statements by the prophet which encourages people to prepare to face the risks of natural disasters.

In conclusion, God created the universe in balance and made people his steward. If people do not protect the environment and corrupts the creation of God, He promises people with a severe punishment that can be in the form of natural disasters.

3.4.1.2 Disaster as a Test

Disasters is seen by Islam as an instrument used by Allah to test people. It is a test for the patience and steadiness of believers (Siddiqi, 2010). Allah says that all prophets and believers are tested by different kinds of tests, such as disasters, to test their patience.

Be sure We shall test you with something of fear and hunger, some loss in goods or lives or the fruits (of your toil), but give glad tidings to those who patiently persevere. Who say, when afflicted with calamity: "To Allah we belong, and to Him is our return" They are those on

whom (descend) blessings from their Lord, and Mercy, and they are the ones that receive guidance. (2:155-157)

Disasters are not only a test of the patience of people who suffered, but also a test to other people who did not suffer the pains of a disaster (Siddiqi, 2010). When a disaster breaks out, it is a test of the faith and charity of other people who did not suffer. They should pay extra attention and help other people who suffered. In a Qudsi 'holy' Hadith reported by Prophet Mohammad (Peace be upon him), Allah says:

Allah will say on the Day of Judgment, 'O son of Adam, I was sick and you did not visit Me.' He will say, 'O my Lord, how could I visit You, when you are the Lord of the Worlds.' Allah will say, 'Did you not know that My servant so and so was sick and you did not visit him? Did you not know that if you had visited him, you would have found Me there?' Allah will say, 'O son of Adam, I asked you for food and you fed Me not.' He shall say, 'O my Lord, how could I feed you and you are the Lord of the Worlds?' And Allah will say, 'Did you not know that My servant so and so was looking for food and you did not feed him? Did you not know that if you had fed him, you would have found that to have been for Me?' 'O son of Adam, I asked you for water and you did not give Me to drink.' The people shall say, 'O my Lord, how could I give You water, when You are the Lord of the Worlds?' Allah will say, 'My servant so and so asked you for water and you did not give him to drink water. Did you not know that if you had given him to drink, you would have found that to have been for Me.' (Muslim, Hadith no. 4661)

So disasters are seen, by Islam, as a test of the faith and patience of people who suffered the disaster, and a test of the faith and charity of people who did not suffer the pains of a disaster.

3.4.1.3 Disasters as Anger Sign

In addition to being punishment and a test from Allah, disasters are also seen by Islam as an anger sign from Allah. When sins and bad deeds are committed by believers, Allah becomes unpleasant and He sends disasters to people to express His wrath and anger (Samat et al., 2001). In such a scenario, no technology or power can stand in the way of Allah's anger and prevent it. The only way to avoid His anger and wrath is to repent and go back to Allah and follow His

teachings. It is reported in (Samat et al., 2001:334) that our Prophet's uncle, Abdullah Ibn Al-Abbas (May Allah forgive him), said "Disasters will not strike except for sin, and it will not stop except with repentance."

Addressing His messenger, Mohammad (peace be upon him), Allah says:

"But God was not going to send them a penalty whilst thou wast amongst them; nor was He going to send it whilst they could ask for pardon." (8:33)

Therefore, believers should ask for forgiveness from Allah to stop disasters.

3.4.2 Disaster Risk Reduction and Islam

The relationship between disaster risk reduction and Islam depends on Muslims' perception of natural disasters. In this regard, there are two main possible relations.

If Muslims hold an extreme fatalistic view of natural disasters, their response to disaster risk reduction will be very passive. That is, Muslims will attribute natural disasters to only the divine punishment from God for sinful people who committed sins and did not follow the teachings of the Holy Quran and the Prophet Mohammad (Peace be upon him). Suffering is used here as an instrument to bring Muslims back to the right path prescribed by God (Bowker, 1970). Importantly, Muslims, in this case, will look at the policies of disaster risk reduction as useless, redundant and, sometimes, forbidden because it is their fate that can never be changed or reduced. The only thing that Muslims can do, according to the extreme fatalistic view, is to obey the teachings of the Holy Quran and the prophet, repent to God, pray and ask for forgiveness.

"Who say, when afflicted with disasters, To Allah we belong, and to Him is our return"
(2:156)

In this regard, Chester et al. (2013: 280) comment, "The only reaction for a devout believer would be fatalistic acceptance of suffering. In this situation, the introduction of policies of civil protection and hazard planning would be problematic." However, Dhanhani (2010: 62) says that:

It should be also noted that no statement by the (Hadith) ever mentioned that natural hazards are expressions of the wrath of God or the result of disobedience. This reflects the meaning in the context of the time of the prophets. Instead of referring to Acts of God, there are many statements in main sources of Islam referring to the need to prepare for disasters and prevent them from occurring.

God mentions clearly in the Holy Quran that evil and harm are the acts of people, not God:

“Whatever of good reaches you, is from Allah, but whatever of evil befalls you, is from yourself” (4,79)

Therefore, the view that natural disasters are divine punishment is contradictory with this very beautiful verse by God, the Compassionate and the Most Merciful. The view that natural disasters and their devastating effects are ascribed to divine punishment was also criticised by the Saudi grand mufti and other eight high profile Saudi Muslim scholars in an interview with Okaz Newspaper (Alhakeem, 2011). The scholars and the mufti argued that it is true that natural disasters are the acts of God, but their devastating effects on humans go back to the administrative corruption in society. The devastating effects of Jeddah Flood 2011, for example, were ascribed by the mufti and the Muslim scholars to the absence of effective drainage systems and other protective procedures.

If Muslims believe that everything was created by God in balance and measure, natural disasters will be attributed to the negative intervention of people in nature and the change in the universal balance. In this case, natural disaster might not be a punishment to sinful Muslims, but natural disasters will be seen as a natural outcome of the negative intervention of people in nature. If Muslims hold such a view, they will consider it their duty to preserve nature and reduce the effects of natural disasters because devastating effects of natural disasters are not their inevitable destiny, but the results of their acts. Therefore, the policies of disaster risk reduction will be a priority to Muslims because Islam encourages Muslims to take protective procedures and mitigate the effects of disasters. For example, Prophet Mohammad (Peace be upon him) said, “If it (plague) be in a country where you are staying, do not go out fleeing it, and if you hear it is in a country, do not enter it.” Also, God says in the Holy Quran:

“And spend in the way of Allah and cast not yourselves to perdition with your own hands, and do good (to others); surely Allah loves the doers of good.” (2: 195)

Based on this verse, if Muslims already know that a disaster might take place and they do not prepare to reduce its effects, such Muslims will throw themselves into destruction with their own hands, which is prohibited in Islam. Hence, disaster risk reduction in Islam is necessary to avoid the destructive effects of disasters.

The above two Islamic views about the causes of natural disasters and the effectiveness of preparation to face their risks are similar to Schipper's (2010) findings about the causes of natural disasters in Christianity and participants' responses:

Table 3.1: Different perspectives of causes of hazard and risk and attitudes about Responding (Schipper, 2010: 389)

Perspective	Cause	Response 1	Response 2	Response 3	Comments
Hazards and Disasters cannot be controlled	<i>Fatalistic:</i> God punishes Bad behaviour by sending hazards and disasters	Good behaviour	Do nothing: fate cannot be changed	God is testing humans; vulnerability to hazards should be reduced to avoid disasters	For some, there is no difference between hazards and disasters, because the causal linkage between hazards and disasters is decided by God. Another view is that suffering is not caused by God, it is a consequence of human actions. Good and moral behaviour
People are victims	God	Do nothing: suffering is necessary	Do nothing: fate cannot be changed	Pray to avoid losses and loss of life	People are helpless victims. Humans must experience suffering to appreciate the difficulties in life and value positive situations. For some, good comes out of suffering. This attitude also reflects the view that hazards cannot be controlled, and consequently disasters cannot be controlled.
Disasters are not natural	Hazards are natural but disasters are a consequence of high vulnerability determined by social, political and economic factors	Reduce vulnerability to hazards	Reduce factors that cause hazards (greenhouse gas emissions for climate change; soil erosion for landslides and floods, etc.)	Build infrastructural defenses	Religious beliefs often focus on hazards or disasters, but rarely consider vulnerability to them as a cause of disasters. Vulnerability does not appear frequently in religious discourses, which focus more on capacity to overcome difficulties than on reasons underlying difficulties.

As can be seen from Table 3.1, the responses of Christian participants in Schipper's (2010) study are somehow similar to the two common views in Islam about hazards. Hazards are either a divine punishment/test from God that cannot be changed or a natural result of the human violation of the divine universal balance. Similar to Schipper's (2010) argument, there is no distinction in Islamic discourse between hazards and disasters. When Muslims talk about hazards, as a punishment/test from God and this cannot be changed, it is not clear whether they talk about hazards or the disasters that result from the vulnerability of people. There will be further discussion of this issue in Section 7.4.

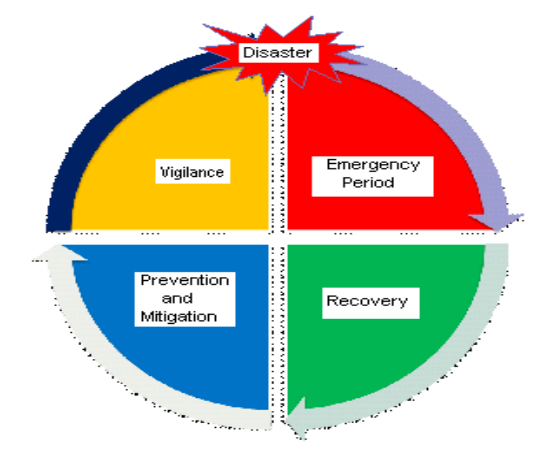
In addition to the above two relationships between disaster risk reduction and faith, a third relationship is proposed by Chester and Duncan (2009: 25) who say that "Christian belief has neither inhibited more practical measures being taken to reduce hazard exposure, nor has it prevented people accepting help from the civil authorities. Believing in two mutually incompatible explanations, or holding one view yet acting contrary to it, is often termed *parallel practice*." Similarly, parallel practice is applied in Islam because if the common view in Islam is that natural disasters are punishment from God, there is nothing said by God in the Holy Quran or by Prophet Mohammad (Peace be upon him) that prohibits Muslims from taking protective procedures to mitigate the risks of natural disasters. On the contrary, Islam encourages Muslims to do everything good to the benefit of humanity, in general, and Muslims, in particular. In this case, Muslims might believe that natural disasters are punishment from God to sinful Muslims, but they can apply the policies of disaster risk reduction. The story of Prophet Noah (Peace be upon him) and his Ark is one of the most famous stories reported in the Holy Quran and other religions, such as Christianity. When God wanted to punish sinful people who disobeyed His prophet, He sent a devastating flood to them and ordered Prophet Noah (Peace be upon him) and other true believers to construct an ark to be saved from the flood. This story is a clear example of the need for disaster risk reduction even if the natural disaster is a punishment from God to sinful people.

This view of parallel practice in Islam was empirically supported by Chester et al. (2013) who conducted a study on the perception of earthquakes by Muslims and their response to the policies of disaster risk reduction. The researchers found that although the participants from the United Arab Emirates gave a religious interpretation to earthquakes, they did not see that such religious interpretations prevent the policies of disaster risk reduction. Homan (2003, pp.

147) also conducted a study on natural disasters and social interaction in Egypt and found that “religious explanation is meaningful to people but very few felt this precluded practical action.”

Based on Hadiths and verses from the Holy Quran, Avianto Muhtadi (cited in IRI-UNOCHA-LPBINU, 2011) proposed a sustainable Islamic perspective for disaster management. This perspective consisted of four main phases: prevention and mitigation, vigilance, emergency response, rehabilitation and reconstruction. These four phases are represented in Figure 3.1.

Figure 3.1: Adaptation of disaster management cycle based on Islamic perspective (Avianto Muhtadi, 2011)



These four phases are mentioned in the Holy Quran and by Prophet Mohammad (Peace be upon him). Prevention of disasters is mentioned in the Holy Quran where God says:

“And cause not corruption upon the earth after its reformation. And invoke Him in fear and aspiration. Indeed, the mercy of Allah is near to the doers of good.” (7: 56)

As is shown in this verse, people are not allowed to make any damage on the earth. Importantly, this damage is not restricted only to physical damage to the earth, but also any type of damage such as damage to people, the relation between people or affecting peoples’ sources of living, as is shown in the following verse:

“Indeed, Pharaoh exalted himself in the land and made its people into factions, oppressing a sector among them, slaughtering their [newborn] sons and keeping their females alive. Indeed, he was of the corrupters.” (28: 4)

Mitigation and vigilance were mentioned in many places in the Hadiths and the Holy Quran. For example, an example of mitigation and vigilance was mentioned in the story of Prophet Joseph in the Holy Quran. The king at that time had a bad dream and Prophet Joseph interpreted that dream to him. This story is mentioned in the Holy Quran as follows:

[Joseph] said, "You will plant for seven years consecutively; and what you harvest leave in its spikes, except a little from which you will eat. Then will come after that seven difficult [years] which will consume what you saved for them, except a little from which you will store. Then will come after that a year in which the people will be given rain and in which they will press [olives and grapes]." (12: 47- 49)

According to this story, people were saved from a natural disaster, which is severe draught, by the advice of Prophet Joseph (Peace be upon him). Actually, what the prophet did was a mitigation and vigilance procedure to reduce the risks of the natural disaster.

As for what to do in emergency situations, the Holy Quran and the Hadiths of Prophet Mohammad (Peace be upon him) ask people to help each other at all times, especially in emergency situations. God says:

"And cooperate in righteousness and piety, but do not cooperate in sin and aggression. And fear Allah." (5: 2)

As for reconstruction and rehabilitation, God says in the Holy Quran:

"Indeed, Allah will not change the condition of a people until they change what is in themselves." (13: 11)

Mohit et al. (2014: 8) state some principles for successful rehabilitation and reconstruction according to the Islamic perspective:

- (1) Increasing public awareness about the cause, symptoms, and handling, so that they would not get the same risks.
- 2) Giving appreciation of tradition (*al-'adah muhakkamah*), culture and local geniuses, so there wouldn't be any friction in the society.

3) Cultivating patience and hope to survive, without reducing the readiness to do self-correction and introspection and to prevent despair.

As for the operational actions in this Islamic perspective, the success of these actions is dependent on the resilience mechanism in the community (Mohit et al, 2014). For example, the role of the mosque is activated by itself when a disaster happens in the community. Mohit et al. also argue that the relief of disaster in the community depends on the speed of response and approaches related to specific situations in the community, such as operational mechanisms that utilize local resources in the community (e.g., mosque). This leads us to the important role of the mosque in disaster risk reduction, which is the topic of the next section.

3.4.3 The Role of Mosque in Disaster Risk Reduction

The mosque is a very important holy place in the life of every Muslim. Muslims gather in the mosque five times a day to perform the five prayers (Fajir, Dhuhr, Asr, Mighrib and Isha). The mosque has also a special importance to Muslims on Friday because all Muslims must go to the Friday prayer, so they gather there to listen to a lecture by imam about things related to Islamic knowledge and daily issues in the life of Muslims. In addition to being a place for prayers, many lectures, workshops and activities are usually held at the mosque to educate people about Islam and daily life issues (Utaberta and Md Esa, 2016). Bahari and Shihabbuddin (2016: 43) explain that the role of mosque “is indeed extended to be a vital avenue for discussion, talk and lecture among people, a platform for collaboration between the mosques and that of governmental and non-governmental agencies and a certified training centre for *imām – tahfīz*, marriage courses, slaughtering courses, *janāzah* management, motivational trainings for teenagers, even income provider for the seekers.”

In the past, the role of mosque was more important than today. There was no headquarter for the Islamic government so the mosque was more like a council where all decisions related Muslims at that time were taken inside the mosque. For example, at the time of Prophet Mohammad (Peace be upon him) and his followers, decisions of war and peace were taken inside the mosque. Because the mosque has a very important role in the life of every Muslim, the first thing that Prophet Mohammad (Peace be upon him) did when he migrated from Makkah to Al-Madinah was to build a mosque (Intan et al., 2015). However, the mosque is used nowadays in most of Muslim countries just for Islamic rituals and prayers.

The mosque has a very important role in disaster risk reduction. Harun-ur-Rashid (2004) stresses the social importance and function of mosques in disaster management. He argues that disaster management is a long process that requires good planning in every phase, rehabilitation, reconstruction and recovery. In this case, there is the option of setting up centres to serve this aim, but this option is not practical because natural disasters are a seasonal not a year-round phenomenon. According to Harun-ur-Rashid (2004), the use of pre-existing institutions or infrastructure, such as a mosque, is a feasible and practical option, especially that the mosque has a special importance in the life of Muslims and it is usually used as a training and teaching support centre. Hence, the mosque is a good option to be used as a centre for disaster management. Similarly, Intan et al. (2015) explain that policies and strategies for pre-disaster and post-disaster management can be decided at the highest level in the country, but the application of these policies and strategies depends on the effectiveness of local centres. In an Islamic country, Intan et al. (2015:86) say that:

The mosque is a social institution that only that will become the last stronghold for Islamic unity. This is because the mosque is completely neutral and independent of political influence. The mosque has the potential to be used as a centre for disaster management at local level. Factors that benefit the advantages of this mosque are relevant central location, social welfare activities clearly exists and its importance as a centre of social activity, regardless of its physical aspects.

Wisner (2010) also stresses on the untapped potential of religious institutions in mitigating the negative impacts of disaster risk reduction at the local level because such religious institutions are usually the first respondents and have very good relations in the local community. However, Wisner says that religious leaders should be trained and engaged in the local policies and strategies of disaster risk reduction.

Cheema (2012) conducted a study investigating the potential roles of the mosque in disaster risk reduction in Pakistan earthquake in 2005. Cheema proposed a detailed discussion of the potential roles of the mosque in disaster management cycle, as is shown in Table 3.2.

Table 3.2: Actual roles of mosques in different phases of the disaster management cycle (Cheema, 2012: 127).

Roles during response and relief	Roles during recovery, reconstruction and rehabilitation	Roles influencing preparedness
<ul style="list-style-type: none"> ➤ Initial contact point ➤ A space and forum for coordinating response and relief efforts ➤ Ensuring the inclusion of vulnerable ➤ Socially integration force ➤ Recruiting volunteers 	<ul style="list-style-type: none"> ➤ Support for livelihoods ➤ Psychological support, spiritual healing and creating resilience 	<ul style="list-style-type: none"> ➤ Influence on disaster risk perception

During the response and relief phase, Cheema (2012) found the mosque to be the first contact point to initiate response and relief operations after Pakistan 2005 Earthquake. For example, if the providers of emergency service wanted to contact the community, they approached the mosque. The strategic position of the mosque in the study, which is in the centre of the studied villages, made it an important coordination place to link communities with relief. The mosque was also found to play an important role in looking after the vulnerable people because the mosque always stresses on looking after the vulnerable people to please God. Similarly, mosques were the best place to find dedicated volunteers who always look to please God by helping to relief the suffering of other people.

During recovery, reconstruction and rehabilitation phase, Cheema (2012) found that the mosque is the best place to support the livelihoods of the community because local people had the chance to gather in the mosque and consult each other about casual crops, crops and seasonal work opportunities. As the infrastructure of the community was severely destroyed by the earthquake, the local people found the mosque as a very important place to share information and support their local livelihood. In this phase, the mosque is a very important place to provide spiritual and psychological support to the affected people, especially those who lost some of their family members. The imam explained to them that the disaster was either a punishment or a test from God, so they should reconcile their relation with God by

praying and asking for forgiveness. Therefore, people did not despair or feel cursed by God, and they retreated to God as advised by the imam.

As for the influence of mosque on disaster risk perception, Cheema (2012) found that the mosque had a very important influence on the perception of disasters by the local community. The majority of the participants in the study strongly believed that disasters occur because of the sins and bad deeds of people, so natural disasters are a kind of punishment or test from God. According to the discussion with the focus group of seven imams, Cheema found that the majority of imams strongly believed in the fatalistic view and they elaborated on this view in their preaching. Therefore, the local community was not enthusiastic about disaster risk reduction and preparedness.

Based on the findings of Cheema's study and the suggestions by the Council of Islamic Ideology in Pakistan, Cheema (2012: 157-158) proposed the potential roles for the mosque and its impact on disaster management and development as shown in Table 3.3.

Table 3.3: Potential roles of the mosque and their effects on disaster management and development.

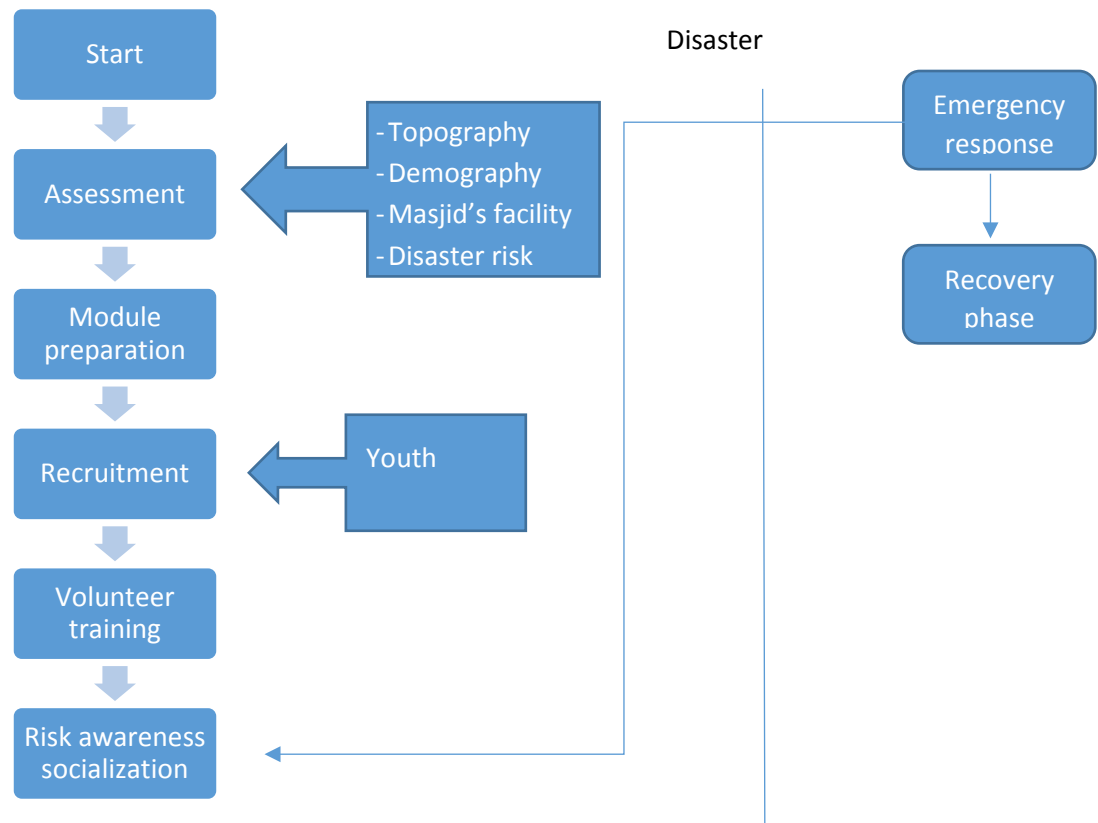
Roles	Explanation	Expected impact on disaster management and development
Educational	Arrangement for using mosque as primary schools after a disaster.	Disasters often destroy educational facilities; yet getting children back into regular routines such as schooling, help them recover after a disaster. Holding classes in the mosque make them accessible to the poorest of the poor-this would raise the capability of vulnerable communities and contribute to effective disaster management. Providing classes in the mosque also presents an opportunity to impact disaster awareness and preparedness training to the children of the poor who otherwise might miss out. Such training could engage imams.
Basic Health Units, distribution of Zakat and welfare funds	Arrangement of Basic Health Unit along with mosques so that hassle-free health services and provision of Zakat and charity to the marginalized section of society.	Considering the case of remote village areas, people desperately need a health service close by. The mosque could improve effective disaster management by serving as a first aid center during response and relief phases of any future earthquake or other natural hazard. Imams, members of mosque committee, and some local women require first aid training. In addition, the mosque committee can identify the needy and poor at local level for the distribution of Zakat and charity.
Communication and advocacy	Requiring local and higher government. Official to liaise with imams and have women-inclusive public hearings in or outside the mosque.	This would directly contribute to advocacy, campaigning and empowerment of vulnerable communities including women by having increased chances of communication and information directly from public officials via a trusted channel such as the mosque. This would be equally useful for pro-poor development and effective disaster management.
Information and coordination center	Recognizing the mosque as a key local institution to coordinate and organize disaster relief and DRR	Outsides organizations can use the mosque to organize their response and relief activities such as identifying vulnerable households and distributing goods. Connecting the mosque with the early warning system and other support

	activities at the local level.	networks would further strengthen capacities and boost recovery processes.
Psychosocial and spiritual wellbeing	Role of mosque and imams in promoting psychosocial healing and spiritual wellbeing at the local level.	By training imams, mosques may be used more effectively for providing psychosocial healing and spiritual wellbeing during disaster recovery and rehabilitation by increasing resilience among communities through religious interpretation of disasters. In addition, this approach may also result in maintenance peace by reduction of instances of stealing and theft in aftermath of disasters.
Other development functions	Establishment of mosque committees comprising local men and women who can engage in development and disaster activities.	<p>The mosque committee could devise culturally appropriate intervention through the following measures:</p> <ul style="list-style-type: none"> • Advocacy for provision, repair and maintenance of civic facilities. • Helping needy, widows and orphans. • Establishment of communal library and literacy center for illiterate in mosques. • Educated individuals to devote some of their time to educate illiterate people of community. • Promotion of sectarian harmony.

Utaberta and Md Esa (2016) also conducted a study on the role of mosque in disaster management, namely flood, in Malaysia. The main aim of the study was to document the role mosque in disaster management during and after the disaster. The researchers found that the mosque has a very important role in disaster management, and it is considered as a major centre in disaster management in Malaysia.

Importantly, Saputra et al. (2014) propose a practical concept, which they call Masjid Tangguh, to use the mosque as a centre of information and education for disaster risk reduction.

Figure 3.2: Local Masjid Tangguh (Saputra et al., 2014)



As can be seen from Figure 3.2, local Masjid Tangguh starts with local assessment of the area in terms of its location, demography, topology of disaster risk and the facilities provided by the mosque. Once this assessment is completed, a curriculum is prepared to address the risk issue in the local area. Then, agents, especially youth, are recruited and trained about volunteerism and disaster risk reduction. Such agents, in turn, socialize with the local community about disaster awareness and disaster risk reduction. If a disaster occurs, these agents coordinate with the local authorities and other parties involved in disaster risk reduction. These agents are also involved in the recovery plan in the recovery phase.

As can be seen from the above discussion, the mosque had a very important role in the life of Muslims in the past and still has very important potential roles in disaster risk reduction. The mosque has a very important role in all the phases of disaster risk reduction. It can be a centre for information sharing and coordination, an important place for promoting education and awareness of the importance of disaster risk reduction and a place for protecting the vulnerable people and boosting resilience to disasters.

3.5 Previous Research on Muslims' Perception of Disasters

Few studies have recently studied how Muslims interpret disasters that they have experienced and the role of Islamic teachings in disaster risk reduction. Unfortunately, this topic is under-researched in the Arab World, so this research is meant to bridge this gap in the literature.

Kasapoğlu and Ecevit (2003) studied the responses of Turkish people towards 1999 Marmara Earthquake in Turkey. This earthquake was one of the most severe natural disasters in the history of the country where 50,000 people were injured, 18,000 people died, 5,000 buildings collapsed and 340,000 were damaged, 14,513 businesses closed, 150,000 people became unemployed, and 129,338 people were forced to live in emergency accommodation (Kasapoğlu and Ecevit, 2003). The researchers conducted interviews with 500 affected participants in three heavily affected areas (Kocaeli, Sakarya and Düzce) a year after the earthquake. Importantly, all the participants in the study were survivors living in prefabricated houses in the three areas of the study. The researchers found that 13 percent of the participants ascribed the eruption of volcanoes to the will and knowledge of God. The responsible behaviour of participants during and after the disaster was also positively related to the strong religious beliefs of people in the affected areas.

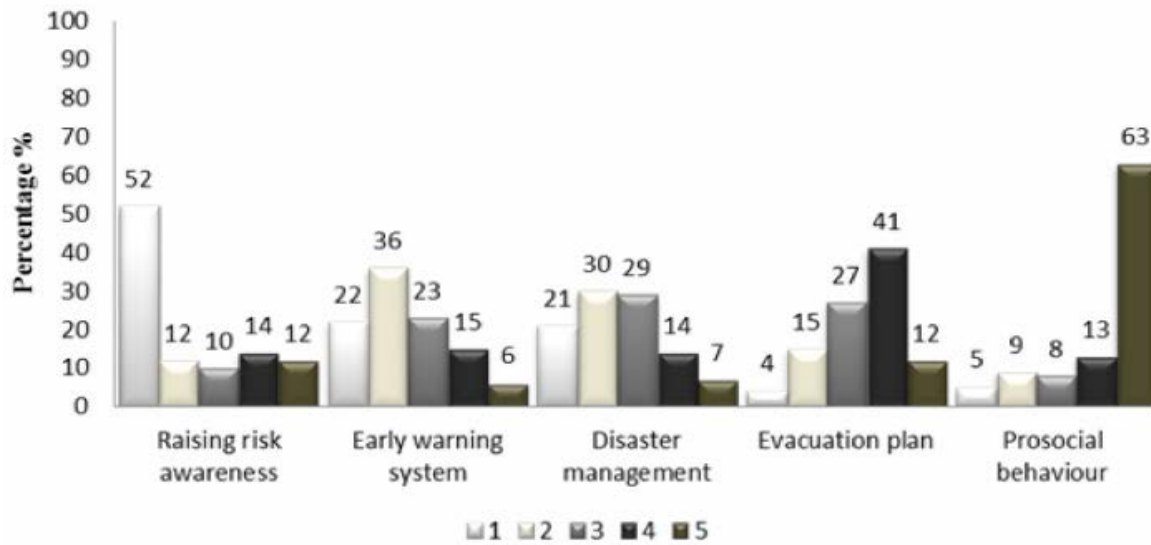
Similarly, Paradise (2005) studied the responses of people who were affected by Agadir two earthquakes in Morocco in 1960. The earthquakes were very severe where 15,000 people died and 25,000 were injured. The researcher interviewed 250 survivors and residents in Agadir. He found that young people (<25) thought that mortar, brick and cement structures were and are always safer in such disasters. Although the researcher found that the medium of television was the best and fastest means for spreading information and knowledge about disasters, television watchers at that time were surprisingly less knowledgeable about disasters. As for the less educated participants, they attributed earthquakes and natural disasters to the divine action of God. The answers of these participants to the majority of questions were always “God Knows” or “God is wisest” because they thought any attempt to forecast earthquakes is forbidden by Islam. They even thought that God saved only the true believers.

One of the important studies, which is directly related to this research, is a research by Adiyoso and Kanegae (2015). The researchers investigated the effect of Islamic teachings on tsunami

preparedness action in Aceh and Yogyakarta, Indonesia. The researchers conducted their study on 173 participants in Yogyakarta and 305 participants in Aceh. The study focused on three religious factors and their effect on the positive interpretation of Islamic teachings on natural disaster that promote Tsunami Resilience Preparedness (TRP). These factors are optimistic view of Islamic teachings that encourage people to prepare for disaster, belief in religious leader and neighbour that support the view of no contradiction between disaster preparation and Islamic teachings. Interestingly, the researchers found that the majority of participants believed that taking part in TRP, which is based on the role of individual, family, community and society, is in accordance with the teachings of Islam. The results suggested that “in community holding less Islamic rules like in Yogyakarta, promoting to take TRP through religious leader will be more effective than community hold strong Islamic rules like in Aceh” (Adiyoso and Kanegae, 2015: 275). Hence, Adiyoso and Kanegae (2015) argue that such findings are against the common belief that natural disasters are a type of punishment by God. Instead, Islamic teachings should be considered as an important part of disaster management policy, especial in a community holding Islamic beliefs.

Another important study on the perception of disasters and willingness of Saudi people to cope with natural disasters was conducted by Alshehri et al (2013). The researchers conducted a questionnaire on 267 participants from different parts in the Kingdom, especially in Makkah area. 63 percent of participants believed that natural disasters are caused by human activities and natural processes, but the participants did not have previous personal experience of natural disasters. Therefore, the researchers argued that the participants had high percentage of risk perception but they lack previous experience. The researchers also found that risk awareness, early warning systems and disaster management as the most important risk resilience for the participants, as is shown in Figure 3.3.

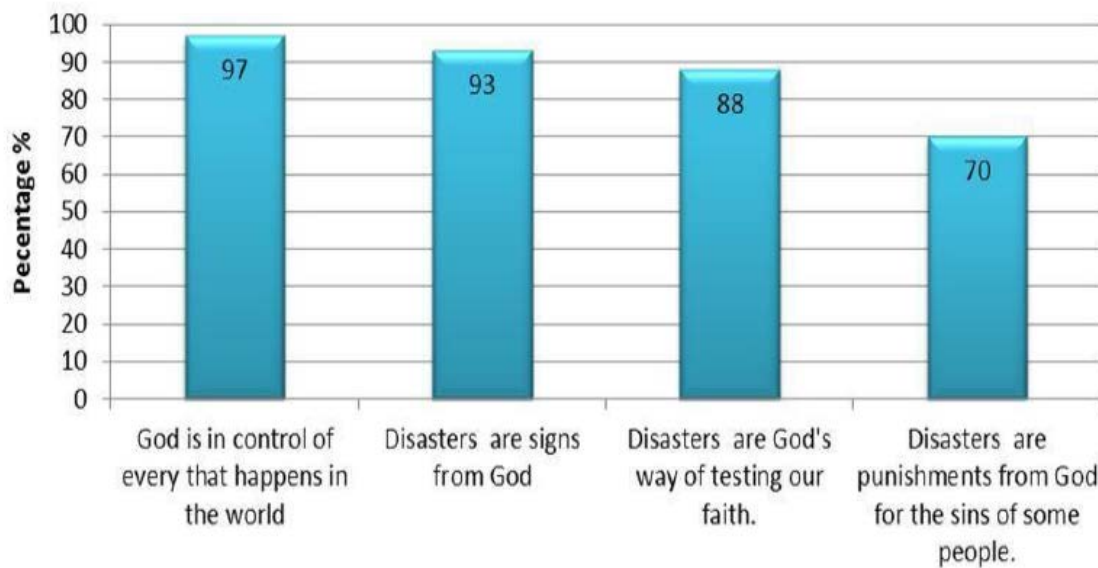
Figure 3.3: Ranking of resilience factors in KSA (Alshehri, et al., 2013: 364)



As for the sources of knowledge about natural disasters, the researchers found that the majority of participants receive their information from the internet (82%), the government TV (80%) and cell phones (63%), but not from the official governmental websites. As for religion, the researchers found that found that Islam was a very important factor that affected participants' perception of natural disasters, and the majority of participants believed that natural disasters are punishment from God. However, the majority of participants showed high willingness to know about natural disasters and be involved in disaster risk reduction, which agrees with the parallel practice proposed by Chester and Duncan (2009).

Alshehri (2015) also studied public perception of natural disasters in Saudi Arabia. A survey was conducted in the 13 provinces in the Kingdom of Saudi Arabia. Results, as is shown in Figure 3.4 shows that the majority of Saudi people had strong Islamic faith which states that God is in control of everything in the universe. The majority of participants also considered natural disasters, in accordance with the common Islamic belief, as a sign from God, a test by God and a punishment from God.

Figure 3.4: Perceptions of the relationship between faith and disasters in Saudi Arabia (Alshehri, 2015: 125)



However, the fatalistic view of disasters in the Kingdom of Saudi Arabia is very strong due to the supremacy of Islamic teachings at schools and in daily life (Baytiyeh and Naja, 2014).

As can be seen from the literature review, few studies investigated the role of Islamic teachings in the perception and preparedness for disaster risk reduction. The majority of participants involved in the reviewed studies believe in the fatalistic view of natural disasters where natural disasters occur by the divine will of God who wants to test people, punish them or send warning signs to repent from their sins and go back to the right track prescribed to them. However, the parallel practice, which was proposed by Chester and Duncan (2009), is applicable in the Islamic World, where Muslims have strong belief in the fatalistic view, but they are happy to be involved in any efforts to take part in disaster risk reduction. It is also noticed that the majority of people who supported the fatalistic view of natural disaster were less educated people.

3.6 Islam and Science²

The discussion of the relation between science and religion is mistakenly based on the assumption that there a conflict between the two. Secular scientists argue that incompatibility

² The main aim of this section is to show that Islam is open to any science or technology that protects human beings and the environment. Therefore, the modern technology used in DRR is welcomed and encouraged by Islam.

exists between scientific and religious explanation of natural phenomena (Faruqi, 2006). However, Abdul-Matin (2010: 4) argues, “The compatibility of religion and science is important because much evidence showing that human beings have been polluting the earth comes from scientific inquiry.” This was mentioned in the Holy Quran that disasters happen on the earth because of the corruption of people (See Section 3.4.1.1 for more details). When Surgeon Maurice Bucaile studied Arabic and the Holy Quran, he commented, “There are statements in the Qur’an whose meaning can only be understood through modern scientific investigation.” (Cited in Abdulrahman, 2011: 53). For example, the famous verse in the Holy Quran which talks about different bodies of water meeting but they do not mix:

“And it is He who has released [simultaneously] the two seas, one fresh and sweet and one salty and bitter, and He placed between them a barrier and prohibiting partition.” (25: 53).

This verse, which was revealed to Prophet Mohammad (Peace be upon him) around fourteen centuries ago, can be interpreted by only scientific explanation. In fact, the status of science in Islam is very high because the first verse revealed to Prophet Mohammad was:

“Read³ (Proclaim!) In the Name of your Lord who created, created man, out of a clot (of congealed blood). Read (Proclaim), and your Lord is the Most Generous, who taught by the pen, taught man that which he knew not” (96: 1-5).

As is seen, from the very beginning of Islam, God ordered Muslims to read and learn at a time when the world was living in complete darkness and ignorance. The Holy Quran is full with examples and verses that encourage people to read and learn. For example, God says:

“Say: Are those equal, those who know and those who do not know? It is those who are endowed with understanding that receive admonition” (39: 9).

As can be seen from this verse from the Holy Quran, Islam makes the rank of people of scholars and people of knowledge higher than the rank of people who do not know. It is only people of knowledge who will understand the signs and warnings sent by God. God also talks about the special rank of people of knowledge in other places in the Holy Quran:

³ The verb ‘read’ in the sense used in this verse is an order to the Muslims to learn about the universe around them and explore the world.

“O ye who believe! When ye are told to make room in the assemblies, (spread out and) make room: (ample) room will Allah provide for you. And when ye are told to rise up, rise up Allah will rise up, to (suitable) ranks (and degrees), those of you who believe and who have been granted (mystic) Knowledge. And Allah is well-acquainted with all ye do” (58: 11).

God also mentions that only people of knowledge will understand the hidden meanings and messages in His holy book:

“...but no one knows its hidden meanings except Allah. And those who are firmly grounded in knowledge say: “We believe in the Book; the whole of it is from our Lord:” and none will grasp the Message except men of understanding” (3: 7).

Since people of knowledge know more about the creation and greatness of God, they will be the ones who fear God the most. That is why God made their rank higher than the rank of people who do not know, as is shown in the following verse from the Holy Quran:

“Those truly fear Allah, among His Servants, who have knowledge” (35: 28).

The Prophet Mohammad (Peace be upon him) talked also about the importance of science and knowledge. Anas ibn Malik reported that the Messenger of Allah, peace and blessings be upon him, said “Seeking knowledge is an obligation upon every Muslim.” So, it is an obligation on every Muslim to seek knowledge and education, and if you do not do that, you will be a sinner. In another Hadith, Abu Huraira reported that he Messenger of Allah, peace and blessings be upon him, said, “Is not the world cursed and everything in it? It is so except for the remembrance of Allah and what facilitates it, the scholar and the seeker of knowledge.” As is mentioned by Prophet Mohammad (Peace be upon him) scholars and people of knowledge are saved from the curse of God because of their higher rank in Islam.

One of the most important Hadiths that shows the high rank of scholars and seekers of knowledge is that the Prophet Mohammad (Peace be upon him) says:

If anyone travels on a road in search of knowledge, Allah will cause him to travel on one of the roads of Paradise. The angels will lower their wings in their great pleasure with one who seeks knowledge, the inhabitants of the heavens and the Earth and the fish in the deep waters will ask forgiveness for the learned man. The superiority of the learned man over the devout is like that of the moon, on the night when it is full, over the rest of the stars. The learned are the heirs of the Prophets, the Prophets leave neither dinar nor dirham, leaving only knowledge, and he who takes it takes an abundant portion.

As can be seen from the verses of the Holy Quran and the teachings of Prophet Mohammad (Peace be upon him), Islam encourages science and knowledge and makes them as an obligation on every believer. The Holy Quran, which is the core of Islam, is full of examples that ask people to look around, think of nature and contemplate to reach knowledge that is only obtained by men of wisdom.

Islam also makes the rank of the scholars comparable to the rank of prophets or messengers. In the Golden Era in the Islamic civilization (800- 1200) when the harmony between Islam and science was at peak, many important inventions and developments were introduced to humanity by Muslims (Faruqi, 2007). The huge expansion of the Islamic civilization during the Golden Era was due to the universal validity of its principles in time and space (Cornell, 1999). These principles that are good to all human beings regardless of their gender, race, ethnicity or origin (Moore, 2006). As is seen in the above verses and teachings of Prophet Mohammad (Peace be upon him), one of the main principles in Islam is seeking knowledge.

However, there is a misconception, especially in the western society, about the conflict between Islam and science. In fact, this misconception is not restricted to Islam, but there is a general belief in the west that there is conflict between religion and science. Faruqi (2006) explains that Islamic science and philosophy were largely affected by the Greek philosophy and ancient knowledge by others, especially Indian. In this regard, Iqbal (1986: 3) says, “Greek philosophy had been a great cultural force in the history of Islam.” However, Kamali (2003) compares between the Islamic science supported by the Holy Quran and the Greek philosophy and shows that the Islamic view of natural science is more comprehensive (Kamali, 2003). The Holy Quran stresses on the idea that it is not enough to study a single phenomenon to know about the human nature, but all natural phenomena around us should be studied ranging from the humble bee a recipient of divine inspiration and to observe the perpetual changes of the wind, the alternation of day and night, the clouds and the planets swimming through infinite space (Kamali, 2003). In this regard, God says in the Holy Quran:

Behold! In the creation of the heavens and the earth; In the alternation of the night and the day; In the sailing of the ships through the ocean for the profit of mankind; In the rain which Allah sends down from the skies And the life which He gives therewith to an earth that is

dead; In the beasts of all kinds that He scatters through the earth; In the change of the winds and the clouds which they trail like their slaves between the sky and the earth - (here) indeed are Signs for a people that are wise (2:164).

Similar to the conventions of modern sciences, Muslim scholars were interested in testing and developing different procedures to test knowledge logically and empirically (Faruqi, 2006b). Therefore, this scientific method of study was applied in the fields of medicine, mathematics and astronomy 1000 years ago. Bammate (1959) says that the main interest of Muslim scholars and scientists was in applied sciences, so they conducted analysis through mathematics and tested theories by observation. Importantly, the scientific method of analysis, which is experimental in character, was applied by Muslims before the times of Newton and Galileo (Faruqi, 2006a).

The response to earthquakes by Islamic scholars in the 15th and 16th centuries explains the real relation between Islam and science. During the 1576 Earthquake in Egypt, Islamic scholars exempted people from congregational prayers and advised them to leave the mosque and buildings to assembly points to reduce the devastating effects of the earthquake (Gari, 2004). Contrary to the widespread misconception that Islam is against science, some Islamic scholars proposed physical philosophy and logic to explain how earthquakes happen (Taher, 1974). For example, AlQazwīnī (1203-1283) cited in (Gari, 2004) explains that gases are pressurized inside the earth until they change into liquids, and these gases escape and cause earthquakes and volcanoes. Interestingly, Ibn Sina, an Islamic scholar, proposed a scientific protective procedure in the 12th century to eliminate the causes of earthquakes (Cited in Gari, 2004). The protective procedure is to dig holes and make wells on lands prone to earthquakes so that the earth depressurizes from gases. If Muslims had had a fatalistic view of natural disasters at that time, they would not have proposed scientific explanation and protective procedures to mitigate the impacts of earthquakes.

The important challenge for Muslim scholars today is the validity and source of knowledge. In this regard, Moaddel and Talattof (2000: 1) argue that “the question of the validity of the knowledge derived from sources external to Islam and the methodological adequacy of the four traditional sources of jurisprudence: the *Quran*, the dicta attributed to the Prophet (*hadith*), the consensus of theologians (*ijma*), and juristic reasoning by analogy (*qiyas*).” To tackle this issue, Faruqi (2006) argues that Muslim scholars have to formulate a revolutionary reform in the

sources of knowledge in Islam and make them in line with the scientific rationality and modern social theory today.

To conclude this section, we can say that there is no real contradiction between Islam and science. On the contrary, most of the verses in the Holy Quran and the Hadiths of Prophet Mohammad (Peace be upon him), as is shown above, make the rank of scholars and people of knowledge very high in Islam, equal to the rank of God's messengers and prophets. Islamic scholar in the golden era of the Islamic civilization were the pioneers in scientific investigation and experimentation, and they proposed different explanations and protective procedures to different natural phenomena.

3.7 Summary

Cultural knowledge and traditions are vital in the study of the natural disasters of any area or community. As was shown above, some people lost their lives because of the ignorance of local cultural knowledge of dealing with the disasters in the affected area, where the local people protected their lives because they such cultural knowledge. As an important component of cultural knowledge, faith is very important in the study of the natural disasters of any community or area. Different faiths propose different views on natural disasters, and people usually response to natural disasters according to their faith although, sometimes, it contradicts with the scientific view.

Islam and Islamic teachings occupy a very significant place in the life of every Muslim. Muslims follow the teachings of the Holy Quran and the sayings of Prophet Mohammad (Peace be upon him). Different views on natural disasters exist in Islam, ranging from a test from God to a punishment or anger sign, and these views have considerable influence on the perception of natural disasters by Muslims. As is shown above, the extreme fatalistic view of natural disasters, which is usually supported in other religions, is not fully supported in Islam. Although the Islamic discourse does not differentiate between hazards and disasters, it is clearly mentioned in the Holy Quran and the Hadiths of Prophet Mohammad (Peace be upon him) that hazards are from God, but disasters are the act of the corruption of people.

The issue of the role of Islamic teachings in disaster risk reduction, as is shown above, is under-researched in the literature. Previous studies, which had some questions that focused on the perception of natural disasters by Muslims, showed that natural hazards were considered by the majority of Muslim participants, especially the common people and poorly educated people, as acts from the God who controls the universe and everything happening in it is accordance to His divine will. However, some participants, especially the educated ones, did not reject other explanations about natural disasters and they were enthusiastic to be involved in any efforts for disaster risk reduction, which questions the validity of the extreme fatalistic view on natural disasters in Islam. A parallel practice between natural disasters and disaster risk reduction, as is shown above, is applicable in Islam. Although Muslims believe that everything in this universe happens according to the divine will of God, there is no verse in the Holy Quran or statement by Prophet Mohammad (Peace be upon him) clearly says that natural disasters are from God and we should do nothing to stop them. On the contrary, the Holy Quran and the Hadiths of Prophet Mohammad (Peace be upon him) are full of examples that encourage Muslims to do anything for the benefit of humanity in general.

The common view that there is contradiction between the teachings of Islam and science is not supported. Islam follows the logic of science and many examples in the Holy Quran, which was revealed about 1400 years ago, are supported by science today.

Chapter Four: Literature Review of Hazards and Vulnerability in the Kingdom of Saudi Arabia

4.1 Introduction

The Kingdom of Saudi Arabia has witnessed many disasters over the last few decades, especially in the last decade. These disasters included flood, dust storms, heat waves and terrorist attacks. Such disasters have had financial and human effects on the kingdom. For example, the deaths in Jeddah flood in 2009 exceeded 150, while the number of injured people exceeded 11,600 (Abosuliman et al., 2013). Such high loss in people's lives, in addition to the financial loss, pushed the government to apply strategies and plans for disaster risk reduction.

This chapter reviews disasters in the history of the Kingdom of Saudi Arabia. First, disaster risk reduction in the Arab world is discussed, with focus on DRR Saudi Arabia; the most important drivers of risk in the Arab World, in general, and in KSA, in particular, are discussed. Unfortunately, there is lack of information about the drivers of risks in KSA. Second, an overview of the Kingdom of Saudi Arabia is presented in terms of population, geography, culture and traditions. It shows that that the Kingdom of Saudi Arabia is situated in a place prone to some natural disasters such as floods, dust storms and heat waves. The culture of this country is different from the culture of other Muslim countries in the region because there is segregation between males and females in all aspects of life. Third, an overview of the history of disaster in the Kingdom of Saudi Arabia in terms of natural and man-made disasters is reviewed. It shows that the Kingdom of Saudi Arabia has been severely affected by natural disasters, especially floods, in the last decade. These disasters have had considerable financial and human impacts on the Kingdom of Saudi Arabia, which pushed the successive governments to be involved in national, regional and international efforts for disaster risk reduction. The implementation of disaster risk reduction in the Kingdom of Saudi Arabia and its national, regional and international efforts in disaster risk reduction are discussed in this chapter.

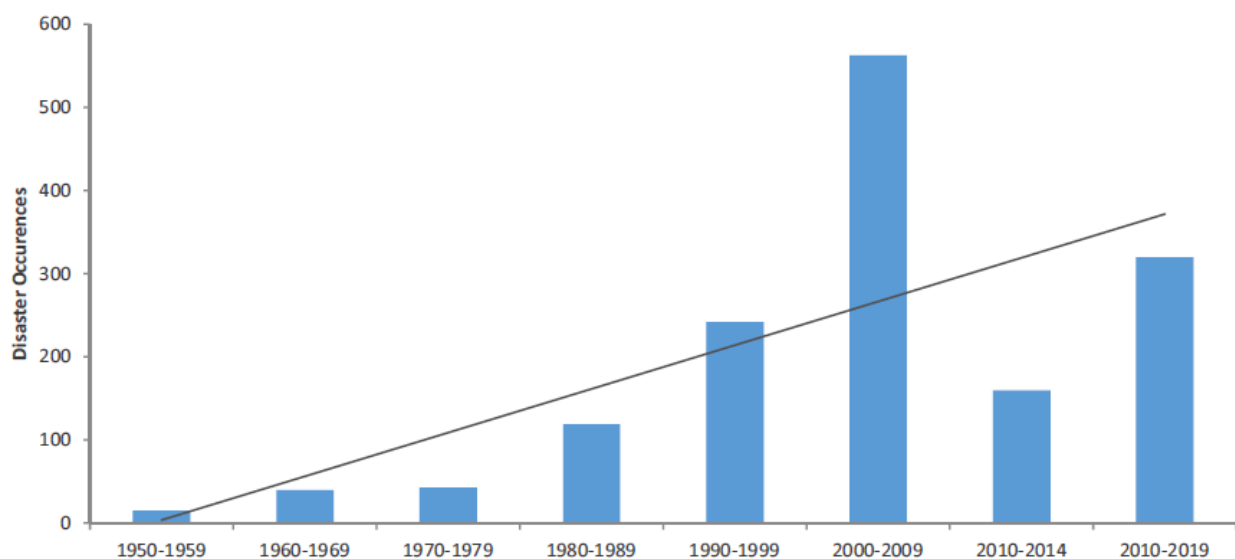
4.2 Disaster Risk Reduction in the Arab World

The estimated population of the Arab countries was around 377 million in 2014 (World Bank, 2014). More than 55 percent of the Arab population, which is growing rapidly, is in the urban areas. According to the International Disaster Database (EM-DAT), the Arab countries had

been influenced by more than 270 disasters along thirty years, which affected more than 10 million people and resulted in more than 150,000 deaths. These disasters included climate change, earthquakes, floods, storms, droughts and sand storms. The report of the UNISDR-ROAS (2013) shows that seismic activity is a high risk in the Arab region where many dangerous earthquakes occurred such as Palestine (1927), Lebanon (1956), Morocco (1960), Egypt (1992) and Algeria (2003). The recent climate change in the Arab region has resulted in heavy rainfall, which led to many floods, especially in Saudi Arabia and Yemen. In addition, tropical cyclones affected the area such as the Cyclone Gonu in the Arabian Peninsula in 2007.

Although there is a huge gap in the information provided, it can be noticed that there is an increase in the reported disasters in the Arab World over the last fifty years as shown in Figure 4.1.

Figure 4.1: Disasters temporal trend in the Arab World (Source: EM-DAT Statistics 1951-2005)



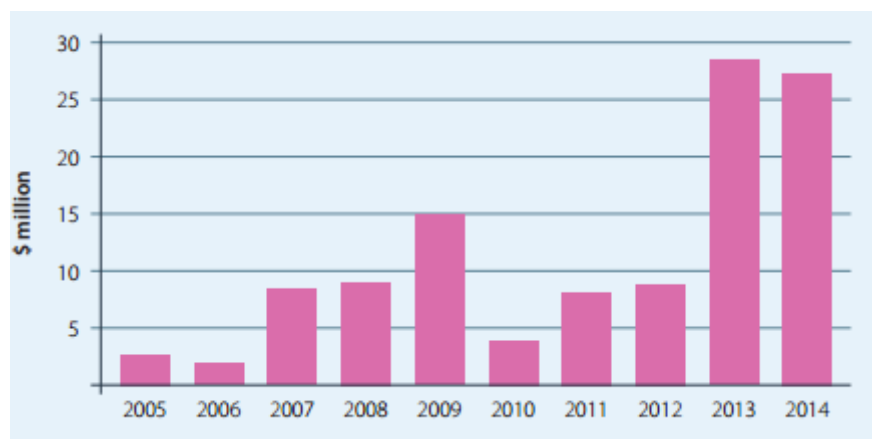
As can be seen from Figure 4.1, there has been a high increase in the occurrence of disasters in the Arab World over the last fifty years. The peak of reported disasters in the Arab World was between 2000 and 2009. This noticeable increase is due to improved reporting of disasters and increased vulnerabilities and exposure in the Arab World (UNISDER, 2015). However, the current civil unrest and escalated violence in the Arab World make the figures much higher.

There are many drivers of risk in the Arab World, but the most important drivers are the ones mentioned by the UNISDR (2013):

- 1- Rising urban population and an increased density.
- 2- Weak governance
- 3- Poor urban planning
- 4- Inappropriate construction quality.
- 5- Concentration of economic assets.
- 6- Ecosystems decline.

Although the Arab states have been affected by many devastating disasters for a long period of time, Arab governments have only recently started to show interest in disaster risk reduction. Arab states have started recently to invest in disaster risk reduction, as is shown in Figure 4.2.

Figure 4.2: DRR expenditure per year in the Arab States (Source: UNDP 2015)



As can be seen from Figure 4.2, the yearly expenditure of Arab countries on disaster risk reduction was low and fluctuating between 2005 and 2012, with no more than \$ 15 million in 2009. However, this expenditure rocketed in 2013 and 2014 to be over \$25 million per year, where eighteen countries of the Arab states invested in disaster risk reduction.

The Council of Arab Ministers Responsible for the Environment (CAMRE) called in a 2007 declaration to “include appropriate mechanisms for risk insurance, improvement in the management and efficiency of natural resources through the use of appropriate techniques and

advanced monitoring, control and early warning systems, as well as adequate preparedness to confront disasters caused by climate change”.

A major achievement in risk reduction for Arab states was in (2008) when the Hyogo Framework for Action (HFA) was adopted as a permanent agenda for (CAMRE) and its body the ‘Joint Committee for Environment and Development in the Arab Region’. In 2010, the League of Arab States, CAMRE and the Arab leaders adopted the Arab Strategy for Disaster Risk Reduction 2020. Risk reduction projects and measures were also incorporated by various organizations under the umbrella of the League of Arab States, the Arab Academy for Science, Technology and Maritime Transport (AASTMT), the Arab Centre for the Study of Arid Zones and Dry Lands (ACSAD), the Arab Organization for Agricultural Development (AOAD), the Arab Labour Organization (ALO) and the Arab League’s Educational, Cultural and Scientific Organization (ALECSO). A regional centre for disaster risk reduction was also established in Cairo to provide training and help to Arab states in reducing risks (CAMRE, 2010).

The main aims of the Arab Strategy for Disaster Risk Reduction 2020 are to outline a vision, identify strategic priorities for disaster risk reduction in the Arab world and support institutional mechanisms and arrangements to implement the strategy and prepare a program of action. The strategy focused on a multi-sectoral approach in line with the global priorities of Hyogo Framework for Action. The initial phase of the strategy started in 2011 and it was agreed to reassess it in the 2015. The Arab Strategy for Disaster Risk Reduction 2020 and HFA2 were reviewed in the First Arab Conference for Disaster Risk Reduction 2013. Discussions and consultations focused on the following most important risk drivers:

4.2.1 Governance of disaster risk reduction

Participants showed that there is institutional gap and challenges in the Arab states. Some of these challenges are lack of financial, human and logistical management and preparation for disaster risk reduction. Also, the Arab states are dominated by highly-centralized government structures which hinders effective participation in disaster risk reduction. Moreover, there is a lack of a policy framework for disaster risk reduction and rules and regulations to mitigate risk in most of the Arab countries. In this regard, participants recommended the following:

- Setting up the required institutional framework with enough authorization and resources to carry out its responsibilities.
- Providing Arab governments with enough knowledge and information base to assess risk and manage it.
- Developing early response systems that enable cooperation between the various response teams.
- Establishing instructions and laws to carry out risk assessments which inform disaster risk reduction strategies.
- All parties should be involved in disaster risk reduction planning in a comprehensive manner.

With regards to the governance of DRR in the Kingdom of Saudi Arabia, there is a national plan adopted by the Saudi government to be applied to mitigate the risks of disasters. Many parties are involved in the planning and implementation of this plan. All of these details will be thoroughly discussed in Section (4.4.2).

4.2.2 Climate Change and disaster risk reduction

Participants in the conference recognized that climate change causes many negative effects on the Arab states such as floods, droughts, sea level rise, desertification, food scarcity and storms. Along with climate change, there are some challenges accompanied such as population growth, water scarcity and lack of political commitment to implement disaster risk reduction. To overcome these challenges, participants recommended that a comprehensive framework, a multi-sectoral approach and strategies are needed address the complications of climate change. In addition, local governments should be engaged in building resilience to the climate change and provide protection and management mechanisms for vulnerable people.

With regards to the Kingdom of Arabia Saudi, it is expected that, by 2050, there will be a considerable decline in agricultural production because of the expected hotter conditions and decrease in rainfall. If temperature rise by 1 to 2 degrees it is likely that more than 30% of crop, fruit and livestock species will become extinct. The Arabian Peninsula, especially the Kingdom of Saudi Arabia, will be severely affected by climate change (Pararas-Carayannis, 2013). Such expectations will, of course, have a negative effect on the industrial growth of the kingdom unless

serious protective procedures are applied to reduce the effects of disasters. Therefore, serious actions should be taken by the kingdom to increase climate resilience.

4.2.3 Urbanization and Unchecked Urban Expansion

The Arab world is one of the highest urbanized regions in the world. Since this urbanization is arbitrary and unorganized, arbitrary settlements and slums are high risk areas which can be very dangerous in the occurrence of natural disasters. To overcome urbanization and expansion, participants in the conference recommended that there should be effective plans and programs to organize the development and expansion of urbanization. Buildings and infrastructure in these areas should be designed in a way to mitigate the risks of disasters.

With regards to the Kingdom of Saudi Arabia, there is a rapid increase in the process of urbanization, especially after rapid economic development which was sparked by the exploitation of oil in the kingdom. However, lack of planned urbanization in the kingdom has made people vulnerable to many disasters such as floods (Al-Hathoul and Edadan, 1995). This point will be discussed in detail in Section (4.4).

4.2.4 Disaster risk reduction finances

Participants acknowledged that the majority of Arab countries have very tight budgets with many restrictions on expenditure and these countries are under the problems of increasing debts. Therefore, there is little chance for implementing disaster risk reduction. The participants recommended that the governments of these countries should look at disaster risk reduction as an investment rather than a cost because disaster risk reduction is much more effective financial responses that follow disasters. Therefore, comprehensive risk financial strategies and risk assessment and management are needed to invest more in vulnerable communities.

The Kingdom of Saudi Arabia, in contrast to the other Arab countries, does not have a financial problem in DRR. However, it lacks effective planning and management of the process of disaster risk reduction. There is strong political will to invest in DRR in the kingdom, but effective planning is needed (Al-Qahtani, 2014). This point will be discussed in detail in Section 4.4.

4.3 Hazards in Saudi Arabia

Some disasters, such as tsunamis, earthquakes and volcanic eruptions rarely occur in the Kingdom of Saudi Arabia. However, other disasters, such as floods, heavy rainfall and dust storms, occur frequently. The kingdom is also expected to be affected by more natural disasters, especially weather-related disasters, because of climate change, sea level rise and global warming (Pararas-Carayannis 2013).

4.3.1 Saudi Arabia: An Overview

The Kingdom of Saudi Arabia, which forms the largest part of the Arabian Peninsula, consists of 13 official provinces as is shown in Table 4.1. The surface area of the kingdom is 2,149,690 km² and the population is 27.137 million (Central Department of Statistics and Information, 2010, United Nations: Statistics Division, 2008). 27.8% of this population is international migrants (Ministry of Economy and Planning, 2010-2014). Table 4.1 summarizes background information about the Kingdom of Saudi Arabia in terms of population, size and provinces.

Table 4.1: Background information on the population and size of KSA according to provinces (adopted from the Central Department of Statistics, Kingdom of Saudi Arabia)

Name	Capital	Area A (km²)	Population C1992-09-27	Population C2013-07-01
Al-Bāḥah	Al-Bāḥah	9,921	332,157	450,700
Al-Ḥudūd ash-Shamālīyah [Northern Frontier]	'Ar'ar	111,797	229,060	351,000
Al-Jawf	Sakākah	100,212	268,228	483,100
Al-Madīnah al-Munawwarah [Medina]	Al-Madīnah	151,990	1,084,947	1,962,600
Al-Qaṣīm [Al-Qaseem]	Buraydah	58,046	750,979	1,337,600
Ar-Riyād [Riyadh]	Ar-Riyād	404,240	3,834,986	7,517,000
Ash-Sharqīyah [Eastern Region]	Ad-Dammām	672,522	2,575,820	4,533,800
Asīr [Aseer]	Abhā	76,693	1,340,168	2,095,900
Ḥā'il	Ḥā'il	103,887	411,284	654,700
Jīzān	Jīzān	11,671	865,961	1,497,400
Makkah al-Mukarramah [Mecca]	Makkah	153,128	4,467,670	7,688,600
Najrān	Najrān	149,511	300,994	555,100
Tabūk [Tabouk]	Tabūk	146,072	486,134	866,800
Saudi Arabia	Ar-Riyād	2,149,690	16,948,388	29,994,300

As is shown in Table 4.1, the Eastern Region is the biggest in size in the Kingdom of Saudi Arabia, while Riyadh and Makkah provinces have the highest population in the Kingdom of Saudi Arabia.

The Kingdom of Saudi Arabia represents the largest part of the Arabian Peninsula. The largest part of the kingdom is a desert. The central part of the kingdom, which is an eroded plateau, has very typical desert weather; that is very hot in summer and very cold in winter. Apart from the coastal plain of the Red Sea, the western area has many mountains. Similarly, the southern area has many mountains, which receive heavy rainfall in winter. In contrast, the eastern part of the kingdom, which has the vast majority of oil resources, is sandy and flat (Pararas-Carayannis 2013).

Riyadh is the capital of the Kingdom of Saudi Arabia. Other important cities in the kingdom are Jeddah, which has a very important port, and Yanbu and Jubail, which are very important industrial cities. Makkah, which is birthplace of Prophet Mohammad (Peace be upon him), and Medina have a very important religious status in the Islamic World. The kingdom is bordered by Yemen, the United Arab Emirates, Qatar, Oman, Kuwait, Jordan and Iraq. The geography of the kingdom ranges between coastal regions in the west and east and many mountains in the southwest areas. The Rub' al Khali, which is one of the largest deserts in the world, is located along the southern borders (Pararas-Carayannis 2013). Figure 4.3 is a map of the Kingdom of Saudi Arabia.

Figure 4.3: Map of provinces of Kingdom of Saudi Arabia (source: Google)



4.3.2 Culture and Traditions in Saudi Arabia

The word culture comes from the latin origin ‘cultura’ which refers to people’s growing cultural actions. It was defined by Adeyemi-Bello and Kincaid (2012: 4) as “a system of values and norms that are collectively shared between groups of people.” Based on this definition, culture refers to what people say, think, make, wear, and speak. It also refers to certain community or society’s traditions, art, literature, feelings, values and attitudes.

Every region or country has its own special culture that distinguishes it from other countries around the world. As a country, the Kingdom of Saudi Arabia has its own special culture which is distinguished from other Arab countries. The culture of the Kingdom of Saudi Arabia is mainly influenced by Islam and the history of the kingdom. The other difference between the KSA and other Arab countries is the complete segregation at all levels of life in the former while the latter does not apply such segregation. Alkahtani et al. (2013) explain that, in order to understand the Saudi culture, you have to understand the cultural differences of Saudi Arabia in terms of language, gender and fear of losing face.

The official language of the Kingdom of Saudi Arabia is Arabic, which is the language of the Holy Quran. Arabic is the main language used in education, media and daily life transactions. Different from the European languages, Arabic is a language that is written from right to the left. The issue of gender is one of the central issues that distinguish the Kingdom of Saudi Arabia. Following the interpretation of Muslim scholars in Saudi Arabia, gender segregation is applied at nearly all levels in life (Alkahtani et al., 2013). Therefore, the Saudi women go to female only schools and universities, and they work in all female settings where they are not allowed to mix with males. The Saudi women do not currently have a role to play in disaster risk reduction, which is administered and managed by men only.

Losing face, which is maintaining the respect and dignity among other people, is one of the central qualities that Saudi people try to avoid. Therefore, people always try to save face by avoiding confrontation with others, using patience, self-control and compromise (Alkahtani et al., 2013).

The attitude of Saudi people is built on establishing confidence and trust between people before establishing any relation or work. The personal honour of family is a key issue in Saudi Arabia where any violation of this sensitive issue is a dangerous offence and insult. The majority of Saudi people have a negative attitude to modernity, which conflicts with the Saudi cultural traditions that highly value the teachings and morals of Islam (ProQuest, 2008). However, some people prefer liberty in social and political practices, but they are still a minority in the Saudi society.

The general widespread image of Saudi Arabia is that it is a very strict and conservative country, which defies modernization, but this is not very true:

While Saudi society may seem closed or repressive to Westerners, Saudis are proud of their country's strong families, low crime rate, and scarce drug problems. Saudis are very religious. Islamic customs, therefore, play a key role in determining cultural practices. Saudi Arabians are proud of the strength of their modern country and are patriotic; at the same time, their chief devotions are to family and religion. (ProQuest, 2008: 3)

In literature, poetry is a cherished art in the Kingdom of Saudi Arabia and it is recited in different occasions. In addition to poetry, the memorization, recitation and interpretation of the Holy Quran is a distinguished art in Saudi Arabia. The kingdom prefers abstract designs rather than the images of people or animals because of the teachings of Islam. Arabic calligraphy is also very commonly used with metal works, paintings, decorations and other arts (ProQuest, 2008).

4.3.3 Man-made Hazards:

A man-made hazard is a hazard that is caused by human factors, such as wars, oil spillage and terrorist attacks (Pararas-Carayannis 2013). Death and injury from man-made hazards, particularly from vehicle accidents, exceed those from natural disasters. The experience of local emergency services and disaster planning is shaped by this experience.

The Kingdom of Saudi Arabia has been subject to many man-made hazards, especially terrorist attacks, in the last two decades. The most common man-made hazards in the Kingdom of Saudi Arabia are terrorist attacks, motor vehicle crashes, Umrah and Hajj season and technological hazards.

4.2.3.1 Terrorist Attacks

The Kingdom of Saudi Arabia has witnessed many terrorist attacks up until recent years. Although about 28 percent of the population, as mentioned above, is foreigners, Saudi citizens and foreigners have always co-existed peacefully together. However, the kingdom has witnessed some terrorist attacks in the last few years, resulting in instability in the kingdom and important impacts on the regional and international political relations (Alamri, 2010). Some of the largest terrorist attacks in the kingdom were 1979 Makkah mosque siege, the 1995

Riyadh bombing, the 1996 Khobar bombing, and the 2003 Riyadh bombing (Hegghammer, 2008). Bombing mosques escalated in 2016 to reach about eight bombings in one year.

4.2.3.2 Motor Vehicle Crashes

Motor vehicle crashes are significant in terms of mortality in the Kingdom of Saudi Arabia. According to the statistics of the Ministry of Interior in 2008, there was around 500,000 motor vehicle crashes in the kingdom that led to 6,000 casualties. In 2008 on average around 18 people died, 101 people injured, and 1350 motor vehicle crashes occurred each day. One reason of such high numbers of motor vehicle crashes in the kingdom was the huge economic progress in the kingdom which led to a dramatic increase in the numbers of vehicle owners (Alamri, 2010). Another reason is the rise in the number of casualties during religious seasons such as Umrah and Hajj, where Makkah alone witnessed 26.02 percent of the total number of motor vehicle crashes (Ministry of Interior, 2008). However, the majority of crashes were mainly related to driver-related offences. Alamri (2010) divided these offences into four main categories: driving misjudgement, vehicle misuse, road code offences and other offences.

4.2.3.3 Umrah and Hajj Season

Hajj and Umrah are the most important rituals in the life of every Muslim. Hajj is considered as one of the five pillars of Islam where every Muslim who is financially-capable has to perform it once in his/her lifetime. Therefore, more than 3 million Muslims perform the rituals of Hajj every year (CDIS, 2014). The ritual of Hajj usually takes place in the twelfth month of the Hajjri calendar (moon calendar). In addition to Hajj rituals, Muslims can perform Umrah anytime during the year.

The sudden increase in the population of Makkah from 200,000 to over 3 million during the rituals of Hajj causes many incidents and accidents. In addition, the infrastructure of the city can hardly cope with the huge numbers of people. Therefore, the problems of overcrowding, increased motor vehicle crashes, trampling and health implications are persistent every year. Table 4.2 summarizes events and death tolls during Hajj from 1975 to 2009:

Table 4.2: Incidents and accidents during Hajj seasons from 1975 to 2009 (Wikiislam, 2013)

Year	Event	Death toll
1975	Fire in a Tent Colony	200
1979	Grand Mosque seizure	382
1987	Makkah Massacre	402
1990	Stampede inside Al-Ma'asim Tunnel (most deadly stampede in history)	1426
1994	Stampede at the Stoning of the Devil Ritual	250
1997	Tent Fire in Mina	343
1998	Incident on Jamarat Bridge	118
2001	Stampede at the Stoning of the Devil ritual	35
2003	Stampede at the Hajj	14
2004	Stampede during the Stoning ritual in Mina	251
2006	Stampede during the ritual Al-Jamarat on the last day of the Hajj	346
2006	Al Ghaza Hotel Collapse	76
2009	Saudi floods	77
2009	Swine Flu deaths at Hajj	5

4.2.3.4 Technological Hazards

Al-Qahtani (2014: 129) defined technological hazards as the “potential partial malfunction or total breakdown of equipment that can significantly cause negative effects to human lives, health and safety, environmental degradation and sustainable development.” Technological hazards can result in different impacts such as health risks, environmental damage and power cuts (Alamri, 2010).

The Kingdom of Saudi Arabia is one of the largest producers of oil in the world. Technological hazards, especially in the oil industry, can arise at any stage ranging from oil extraction to refinement and exportation. Typical damages in this industry are pipes leaking, wells damaged, oil spillage, etc (Alamri, 2010). Although the Saudi Standards, Metrology and Quality Organization (SASO) is active in reducing technological hazards resulting from oil industry, unfortunately 36 oil spills were documented in the Arabia Gulf in 2005 alone (Al-Suwian, 2005).

4.3.4 Natural Hazards

The Kingdom of Saudi Arabia has a complicated geology and geomorphology because it is located along an active tectonic zone of the Red Sea (Al Saud, 2012). The area has experienced many natural disasters over the years. Al-Bassam et al. (2011) point out that volcanic and

earthquake hazards are common in the north western part of the kingdom (Tabuk and Madinah provinces), while the western and central provinces of the kingdom (Makkah and Riyadh) are exposed to floods. Landslides are common in the southern western mountain areas of the kingdom (Asir and Jazan provinces). Dust storms are a critical hazard in the whole provinces of the kingdom, especially in the central and eastern regions.

4.3.4.1 Floods

According to Alshehri et al (2013), floods are the most frequent events in the country and they account for 7 of the 11 most damaging disasters between 2000 and 2011. Floods have different causes; there are Riverine floods which are caused by the overflow of water from rivers; Estuarine floods which are caused by storm-force winds and tidal surges; and Coastal floods which are caused by hurricanes, tsunamis and cyclones. Al-Momani and Shawaqfah (2013) say that flash floods are very common in Saudi Arabia because of many reasons, such as settlement pattern, increasing variability in climate and land degradation. For two decades, there has been a considerable loss in property and life because of the intense heavy rainfall which caused floods in settlements in many basins, especially in Riyadh, Jeddah, Makkah and Tabuk. Al-Momani and Shawaqfah (2013) argue that the main reason behind these floods was always human intervention.

Alharbi (2013) points out that the Kingdom of Saudi Arabia does not experience the three flood types mentioned earlier, it does experience flash-flooding. Heavy rainfall can cause floods when water level in rivers and lakes rises and overflows either banks or dam river banks, but Alharbi (2013) says that the Arabian Gulf nor the Red Sea has caused any hazard for the Kingdom. The important question here is: why did floods, especially flashing floods, happen in Saudi Arabia?

Table 4.3 summarizes the main floods which have occurred in the Kingdom of Saudi Arabia between 1941 and 2013.

Table 4.3: History of floods in KSA (Abosuliman et al., 2013)

Flood	Death	Injured	Year
Kabaa flash floods	N.A.	N.A.	1941
Flash Flood	20	1,000	1964
Floods in Northwest of Kingdom	32	5,000	1985
Yanbu and Asir floods	26	N.A.	1997
Makkah floods	31	N.A.	2002
Medina flood	29	43	2005
Jeddah flood	163	11,640	2009
Jeddah flood	10	5,000	2011
Riyadh flood	13	N.A.	2013

Kabaa flash floods: heavy rainfall in 1941 caused destructive floods in Makkah which immersed the area with water. Unfortunately, there is no available recorded information about the flood except of some pictures of Kabaa immersed in water, as is shown in Figure 4.4.

Figure 4.4: Water around Kabaa in 1941 flood



(Source : <http://www.globalsecurity.org>)

Flash Flood in 1964: it was the first recorded natural flood in the Kingdom of Saudi Arabia where heavy rainfall caused destructive flash floods. The floods killed around 20 people and injured 1000 and caused serious damage to properties.

Northeast Floods in KSA (1985): it was the worst flood for a half century in the region where at least 32 people were killed and around 5000 people were injured. There is no recorded data on the damage to properties.

Yanbu and Asir Floods (1997): Yanbu is in the western part of the kingdom while Asir is located in the Southwest part of the kingdom. Two floods occurred in the same year in these two areas. In Yanbu, heavy rainfall generated a flash flood which killed at least 10 people and damaged a large part of the area. In Asir, the heavy rainfall caused a flash flood which killed 16 people and damaged 100,000 km² of land.

Makkah Floods (2002): Heavy rainfall lasted for a week and killed at least 31 people.

Medina Flood (2005): Heavy rainfall in 2005 caused an overflow of water from Yamamah Dam which was damaged and this generated a destructive flood. In addition to serious damage in the area, 29 people were killed and 43 were injured.

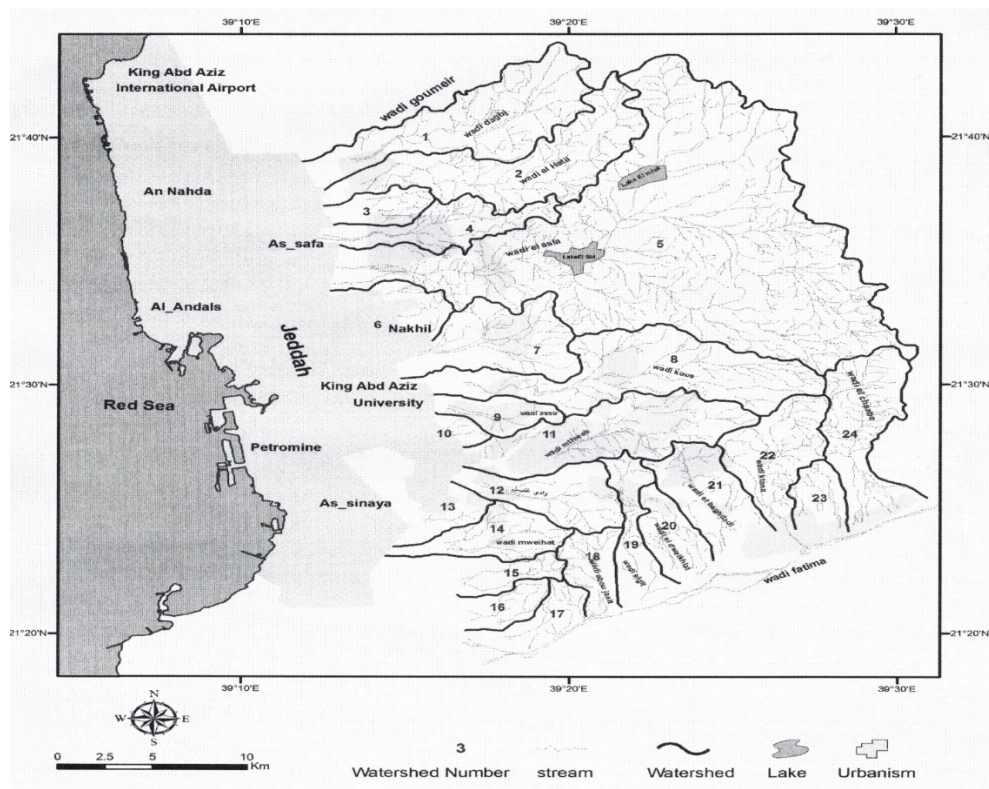
Jeddah Flood (2009): it has been the most destructive recorded flood in the Kingdom of Saudi Arabia. In November 2009, heavy rainfall generated the major destructive flood in the KSA leading to the death of 163 people and injury of 11,640 people. Main infrastructures in the city were completely destroyed such as King Abdullah Bridge and King Abdulaziz University (Alharbi, 2013). In addition to the casualties and injuries, the financial loss was high; it reached the peak of 3 billion Saudi Riyal, in addition to 5.1 billion Saudi Riyal as a compensation to affected people (Momani and Fadil, 2010). The estimated number of damaged properties and cars was 11849 and 10913, respectively. Moreover, there was 60% decrease in the sales of shops and a fear of the spread of epidemics and diseases, such as dengue fever (Momani and Fadil, 2010).

Momani and Fadil (2010) attributed such considerable human and financial loss to many factors. First, warnings from the meteorological services to stakeholders and people of the heavy rainfall and possible damaging effects were delayed because their area did not have mobile and fixed disasters warning systems and devices. If such warning systems and devices had been used, it would have been possible to inform residents and the official Saudi TV

channel. Second, the declaration of recovery stage was delayed because the Civil Defence in the area had very poor technologies, so the search for missing bodies was much delayed. Such poor management was due to the lack of organizing body in the area to know the requirements of Civil Defence and work on emergency plans. Third, there noticeable failure to maintain the drainage and floodplain channels to protect the city from possible floods.

What generated the flood? Al Saud (2010) explains that the city of Jeddah is located in a coastal plain surrounded by a number of mountains and valleys. The city, as is shown in Figure 4.5 is surrounded by 24 basins which are opened to Jeddah (Al Saud, 2010):

Figure 4.5: Watersheds map of Jeddah region (Al Saud, 2010: 843)

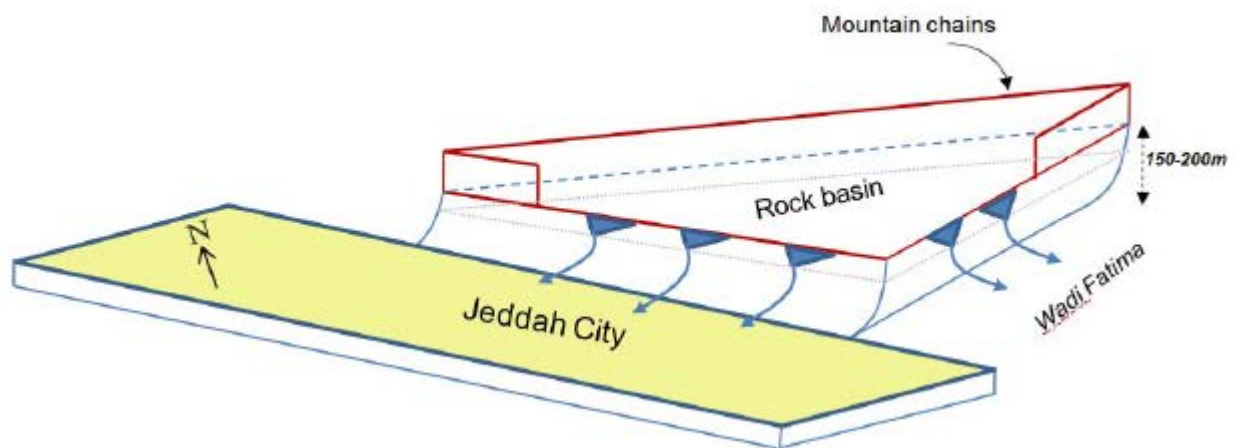


Al Saud (2010: 842) explains that:

These basins together compose a unique geomorphologic feature appears as a huge rocky basin surrounded by mountain chains. These chains are geologically-controlled and forming a triangular orientation. This geomorphic feature is almost closed, except some channelling systems towards Jeddah city

to the west and Wadi Fatima to the south...Therefore, rainfall water accumulates in this basin, whose valleys are filled by thick sediments, and when these sediments are oversaturated with water they tend to move downward along valleys to outlet into the adjacent hill slopes of Jeddah city and Wadi Fatima.

Figure 4.6: Schematic figure showing the rock basin (Al Saud, 2010: 844)



Jeddah Flood (2011): This flood, similar to Jeddah flood 2009, was caused by water overflow from the rocky basin. 10 people were reported to be killed while 5000 persons were injured. The officials in the city attributed the flood to problems with the drainage system (Alharbi, 2013).

Riyadh Flood (2013): There is not much recorded information about this flood, but the BBC reported that 13 people were killed.

Pararas-Carayannis (2013) argues that the drainage system in the most of cities in the kingdom is underdeveloped because of the infrequency of floods. Also, the major cities in the kingdom are located on low elevation and are surrounded by a series of mountains which increases the possibility of flash floods in different regions in the kingdom.

4.3.4.2 Cyclones and Cyclone Surges

The Arabian Peninsula is not historically associated with cyclones. However, in 2007 tropical cyclone Gonu hit the gulf and coastal area of Oman causing great damage and destruction. The high water marks exceeded 5 meters in the area of Ras al-Hadd at the eastern tip of Oman (Fritz et al., 2010). Despite the fact that no surges were recorded within the Gulf, it is highly likely strong winds may have been experienced in other Gulf States and not only in Oman.

Thus, the Arabian Gulf is likely to experience similar cyclones which could affect oil fields, seaports and shipping facilities. Given that Saudi Arabia's financial strength lies mainly in the Eastern Province, the costs of a natural disaster in this region would be tremendous.

4.3.4.3 Dust Storms in KSA

The Middle East, especially the Kingdom of Saudi Arabia, are regularly affected by dust storms which occur during spring and autumn (Almazroui, 2013). Alharbi *et al.* (2013) say that desert dust storms in the Kingdom of Saudi Arabia are considered one of the most severe natural hazards. For example, a five-year study of the air of the capital, Riyadh, showed a high rate of pollution 29 percent, of which 74 percent was attributed to desert dust storms (Alharbi and Moied 2005). Basahy (1987) estimated the rate of dust in the Kingdom of Saudi Arabia to be 196 to 220 tons km² per year.

The most severe dust storm in the Arabian Peninsula, especially the Kingdom of Saudi Arabia, occurred in March 2009. It approximately covered a distance of 1,500 km and an area of 300,000 km² leading to severe health problems to many people in the kingdom (Alharbi *et al.*, 2013). Alharbi et al. (2013: 517) commented:

This dust storm, which left thousands of people choking on heavily dust-polluted air, is associated with an enormous increase in respiratory hospital admissions in the city of Riyadh. In addition, the associated low visibility resulted in many group car accidents in several parts of the city. During the event, hourly visibility of 50m was reported in Riyadh and Qaisummah, whereas hourly visibility of 100m was reported in Hafr Al-Batin and Dhahran.

Surprisingly, there were no warnings given from the media to warn people of this natural disaster.

Many studies have shown that the temporal and spatial distribution of dust storms in the kingdom varies. For example, Goudie and Middleton (2006) found that dust storms peak in the eastern area of the kingdom, especially the Rub' al Khali Desert, during spring-summer seasons (March-August). Dust storms were also found to peak in summer in the south while in spring in the north of the kingdom (Kutiel and Furman, 2003). As for the central region, it was found that the peak of dust storms is in spring (Sabbah and Hasan, 2008). Importantly, the dustiest regions in the kingdom are the eastern and western coastal areas (Kutiel and Furman, 2003).

There are many sources for dust in the Kingdom of Saudi Arabia. The two main sources of dust in the kingdom are the Rub Al Khali and Ad Dahna Deserts (Goudie and Middleton, 2001, 2006). In addition, the shamal winds lift dust from Iran and Iraq to the northern region of the kingdom. This dust is “associated with low pressure anchored over southern Iran that forms a strong baroclinal gradient with a semi-permanent anticyclone over northern Saudi Arabia.” (Goudie and Middleton, 2006: 26). Alharbi et al. (2013) say that Qasim region and the Adibdibah and As-Summan Plateau regions are rich sources of dust storms which can be extended to other regions in the kingdom, as was the case in the 2009 dust storm in Riyadh. With regards to this severe dust storm in 2009, Alharbi et al. (2013: 525) explain “During episodic torrential rainfall and runoffs, fluvial delivery of fine-grained sediment from the surrounding higher areas in these regions takes place and temporary crusts form in evaporative tidal flats and wadis. Eventually, these evaporative tidal flats and wadis became active areas for dust emissions.”

Dust storms have affected the Kingdom of Saudi Arabia at different levels. Ibrahim and El-Gaely (2012) found that dust storms destroy the natural environment in the kingdom. That is, dust storms decrease agriculture productivity by removing the nutrient-rich lightest particles and organic matter. Also, the fine particles of dust shade leaves resulting in serious damage to most plants. Moreover, the pH of 8.9 means the acid precipitation which is associated with dust storms in the kingdom has dangerous effects on the ecosystem, especially stone decay (Goudie and Middleton, 2006). Mohamed and Al-Akad (2014) found that the dust of broken mountains is one of the main reasons behind respiratory diseases, especially asthma which is at high

prevalence 12 percent in the kingdom. Maghrabi et al. (2011) say that dust storms are correlated with visibility problems in the kingdom, which leads to many traffic accidents and aircraft problems. Goudie and Middleton (2006) reported that dust storms in the kingdom decrease visibility by 1.6km for forty-one days every year.

As can be seen from this overview of the history of natural hazards in the Kingdom of Saudi Arabia, floods and dust storms are the most common natural hazards in the kingdom. Many floods, especially Jeddah Flood 2009, hit the kingdom causing many human and financial losses in the Kingdom of Saudi Arabia. Poor drainage systems, absence of emergency plans and lack of organization were the main causes of the high human and financial losses caused by floods in the kingdom. As for dust storms, it is a permanent natural hazard that affect the different regions in the Kingdom of Saudi Arabia all year round. Low visibility, health problems and agricultural problems are usually associated with dust storms in the kingdom.

4.4 Vulnerability and Disaster Risk Reduction in Saudi Arabia

When any disaster happens, it is expected that there would be shortage in resources and disorder. There would also be a number of casualties, destruction in infrastructure, various impacts on safety and health, different impacts on organizations, communities and the environment, which requires cooperation between different parties in the affected country. Seismic activity, petrochemical hazards and climate change has been the main risks which frequently have affected the environment in the kingdom. It is reported that the estimated loss of floods in Saudi Arabia between 2008 and 2009 was about \$1.3 billion (Al-Qahtani, 2014). Hence, exploration of disaster risks and preparing to face disasters in the Kingdom of Saudi Arabia can help the kingdom to prepare well for disasters which may have detrimental impacts on health and safety, the environment, development and the vulnerability of communities (Al-Qahtani, 2014). This section reviews vulnerability and previous studies in the management of disaster risks and preparedness of the Kingdom of Saudi Arabia for disaster risk reduction.

4.4.1 Vulnerability in the Kingdom of Saudi Arabia

The vulnerability of Saudi Arabia to climate change and disasters is expected to be worse in the future (Pararas-Carayannis, 2013). According to the warnings of the World Bank, the rate of the risks of the climate change is faster now, and the global average temperature could rise

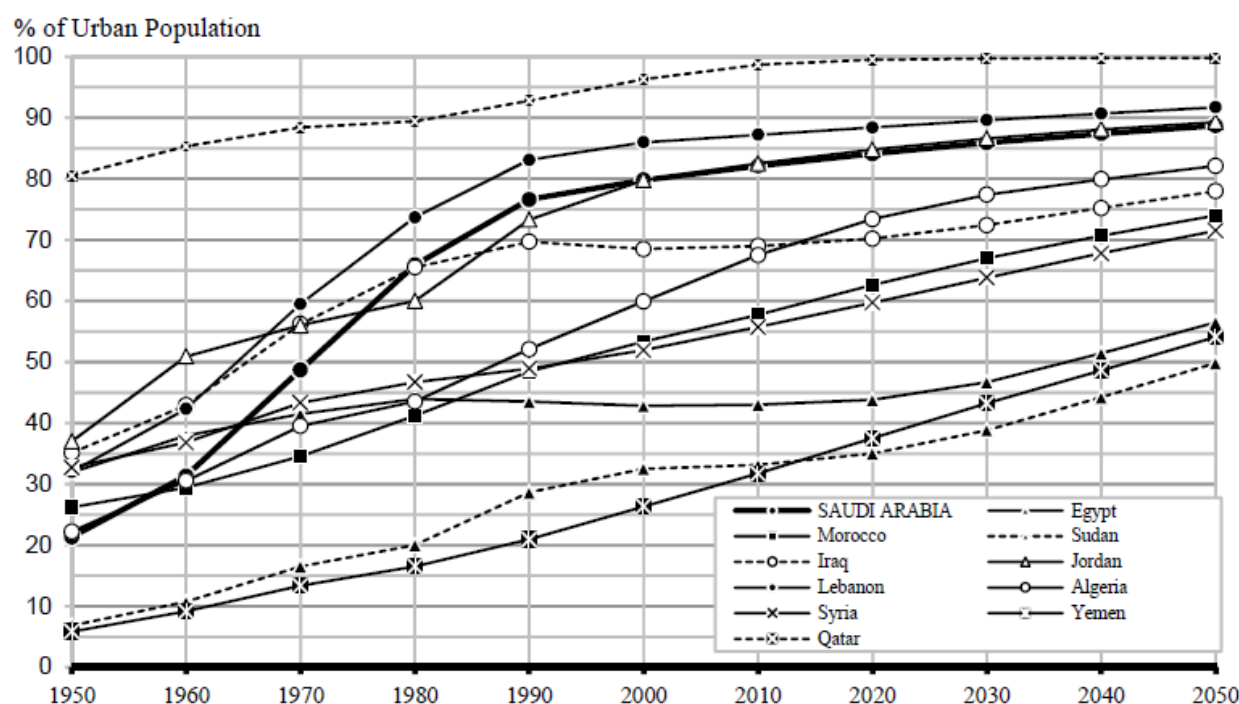
by four degrees Celsius. If this does occur that the climate of the kingdom will be much hotter. This will mean that the expected effects of climate change and the related disasters will be greater in the future. Based on these expectations, tourism and agriculture will be seriously affected in the kingdom. Actually, agriculture has been already affected because the area has become drier and flash floods have become more frequent. This latter disaster has witnessed a five-fold increase since 1990 because of heavy rainfall (Pararas-Carayannis, 2013). The Kingdom of Saudi Arabia has many vulnerabilities which affect disaster risk reduction in the country. One of the most significant vulnerabilities is the Hajj (Pilgrimage) season where about 3 million people meet in one place every year to perform the holy rituals of Hajj. After this huge gathering, three to four weeks are spent on cleaning the holy places and carrying maintenance work instead of discussing and preparing new emergency plans.

Another important vulnerability in the Kingdom of Saudi Arabia is the rapid increase in the process of urbanization. The first recorded process of urbanization started in 1912 by a political support from the founder of the Kingdom, King Abdulaziz, who unified the kingdom as one state (Dar al Liwa, 2000). The king planned a controlled settlement of Bedouin at a place called Artawiyah (Shamekh, 1975). Alkhedheiri (1998) says that such settlements were known as Hijars and there were about four thousand settlements around the kingdom in 1982.

There are many factors which have contributed to the considerable rise in urbanization in the kingdom over the last few decades. The most important factor is the exploitation of oil in the kingdom which has had a considerable effect on the economic activity in the kingdom. Glasze and Alkhayyal (2002) explain that the rapid exploitation of oil affected the kingdom in two ways: firstly, the individual prosperity of many Saudis substantially increased, and secondly the exploitation of oil contributed the growing development in the infrastructure of the kingdom in terms of education, health care and transport. Another important factor that contributed to the rapid increase in economic activity in the kingdom is the political stability in the kingdom (Al-Hathloul and Edadan, 1995). Consequently, a dramatic increase in the process of urbanization was registered in the kingdom between the 1950s and 1980s (Glasze and Alkhayyal, 2002). Even though this significant increase in urbanization in the kingdom started to decrease after the 1980s, it started to dramatically increase again (United Nations, 2008).

Urbanization in the Kingdom of Saudi Arabia has been the highest in the Middle East and North Africa (henceforth, MENA) region. Compared to other Arab countries, such as Egypt, Iraq and Syria, urbanization in the Kingdom of Saudi Arabia has trebled from 1950 to 2000, and it is anticipated to increase to 2050 (UN DESA, 2014), as is shown in Figure 4.7.

Figure 4.7: Percentage of urban population in KSA compared to Arab Countries (Abou-Korin and Al-Shihri, 2015)



As is shown in Figure 4.7, the percentage of urban population in the Kingdom of Saudi Arabia has dramatically increased from 20 percent to 80 percent in 1950 and 2000, respectively. It is also expected to reach a high of 90 percent in 2050. In numbers, the urban population in the Kingdom of Saudi Arabia has jumped from 665,000 to 24.8 million and expected to reach 35.8 million in 1950, 2015 and 2050, respectively (Abou-Korin and Al-Shihri, 2015). This dramatic increase represents 45 percent of the urban population in the Kingdom of Saudi Arabia today.

Such rapid urbanization has considerable impacts on the agricultural land and infrastructure in the Kingdom of Saudi Arabia. For example, Abou-Korin and Al-Shihri (2015: 52) point out that “The main challenge here is that the Kingdom needs to build, in the next 35 years, about half of all cities available today in the Kingdom. To put it simply, the Kingdom needs to build 44 new cities, each of 250,000 inhabitants; a city every 9 months from now on till 2050.” This

means that the government should work hard to meet the increasing demands of urbanization in terms of improving the infrastructure and providing housing and the main services to the new comers to cities.

The most important impact of urbanization is that it can have an effect on the occurrence of floods. Sharif et al. (2016: 718) studied the impact of urbanization on the city of Riyadh and found that “urbanization can significantly increase the run-off volume and peak discharge resulting from a given storm, as well as the flood hazard area and flood depth. This is due to obstruction of natural run-off and decreased infiltration. Therefore, the rapid urbanization will significantly increase the overall vulnerability of the city and will expose an increased number of critical facilities, properties, and people to the risk of flooding.”

Rapid unplanned urbanization was one of the factors that contributed to the vulnerability of Saudi people in Riyadh to flash floods. Rahman et al (2016) investigated the social vulnerability, the physical vulnerability and the composite flash flood vulnerability indices of 153 neighbourhoods of the city of Riyadh. After computing and mapping all of these factors, the researchers found that vulnerability scale varies in different parts of the city and its neighbourhoods. For example, the results of the composite flash flood vulnerability indices showed that the central and southern half of the city was highly vulnerable while the western neighbourhood, which is mountainous, was the least vulnerable to flash floods. As for the northern and north-eastern peripheral neighbourhoods, it was moderately vulnerable. The social, economic and demographic indicators showed that foreign workers who were living in the central, south, and south-eastern neighbourhoods were more vulnerable to flash floods than the rich Saudi people who were living the less populated areas in the northern half of the central city, western, north-western, and southwestern neighbourhoods. The researchers found that unplanned urbanization, rapid population growth, increased sewage runoff, increased surface imperviousness and inadequate drainage contributed to flash floods in the city of Riyadh and they are expected to increase the vulnerability of the city to flash floods in the next 25 years. Most importantly, the victims of flash floods over the past seven year were mainly vulnerable people, such as women, old people and children. Interestingly, the researchers found a relation between ethnicity, previous experience and flash floods. For example, most of the victims were Saudi and non-Saudi people who did not have any previous experience of flash floods, while none of the victims was Asian, who had previous experience of flash floods. The researchers

reported that the Saudi officials in the city issued early warnings of heavy rainfall and the high probability of flash floods, but surprisingly the Saudi people did not understand these warnings and their severity. Rahman et al (2016: 1826) concluded that “The level of city’s preparedness, people’s capacity to respond to and cope with, challenges of mitigation, adaptation, and resilience to hazardous flash floods are grossly inadequate due to lack of previous experiences. Higher training and frequent simulation exercises on flash flood management for both city residents and government officials are needed to improve the city’s preparedness for managing the disaster.”

External migration is also an important vulnerability in the Kingdom of Saudi Arabia. The Kingdom of Saudi Arabia is one of the five major destination for foreign migrants in the world, and ranks the fifth amongst the ten top countries of foreign population (Al-Gabbani, 2009). Historically, the Kingdom of Saudi Arabia has attracted many migrants over the last eight decades. Migrants from Jordan, Egypt, Iraq and Yemen came to the kingdom to work or study (Basha, 1988). However, in 2004, there was an influx of migrants from non-Arab countries, such as India, Pakistan and Bangladesh (Al Bassam, 2011). Al-Gabbani (2009) points out that there are many reasons behind this external migration. For example, the rapid development in the Kingdom of Saudi Arabia was accompanied by a diminutive size in the Saudi population. In addition, there was shortage of workforce in the kingdom, especially skilled workers. Migrant workers constituted 50.2 percent of the total labour force in the kingdom in 2009 (Central Department for Statistics and Information, 2009), which represents 27 percent of the total population in the Kingdom of Saudi Arabia. In 2010, the number of foreign workers increased to reach 27.8 percent of the total population in the kingdom, which causes many concerns to the Saudi government (Internal Organization for Migration, 2010). The last up-to-date official statistics of foreign workers in the Kingdom of Saudi Arabia was released in 2016, where foreign workers and their dependents represent one third of the population in Kingdom of Saudi Arabia now (Saudi General Authority for Statistics, 2017). Therefore, the Saudi Arabian Manpower Council imposed strict restrictions on the number of foreign workers and their professions in the Kingdom of Saudi Arabia. The council aims for a ten percent limit on the total number of foreign workers and restricts the professions to 34 (World Bank, 2009).

The main recipient provinces of foreign workers are Makkah Province, Riyadh Province and the Eastern Province. These three provinces, especially Makkah, have the highest number of non-Saudis living in them (Al-Gabbani, 2009).

The above discussion showed that many factors make people in the kingdom vulnerable to different types of disasters. The current infrastructure in the Kingdom of Saudi Arabia does not meet the requirements of the rapid increase of population, which makes people vulnerable to different hazards, such as diseases and floods and other natural hazards. Therefore, the Saudi government should take protective procedures to reduce the vulnerability of people to disasters. The next section discusses the efforts of the Saudi government in disaster risk reduction.

4.4.2 Saudi Efforts for Disaster Risk Reduction

Although the Kingdom of Saudi Arabia is facing an increasing number of disasters, it has been very slow in developing emergency logistics systems. Many man-made disasters, such as terrorist attacks, have been reported in Saudi Arabia. Similarly, many natural disasters, especially flood, have been reported, yet very little has been done in terms of disaster preparedness. Between 1900 and 2010, floods were the major cause of disasters with 7 out of 10 disasters during that time caused by floods in the Kingdom of Saudi Arabia (Abosuliman et al., 2013).

Al-Qahtani (2014) says that there have been huge efforts in the Kingdom of Saudi Arabia to effectively manage disasters. However, these efforts and concerns have been reactive more than proactive. Moreover, the target of the efforts of disaster management was not to reduce vulnerability and exposure to hazards in the Kingdom of Saudi Arabia. This situation becomes worse with the increase in the number and violence of disasters. It is the right of affected people to be protected from the impacts of disasters, and such an aim can be achieved by effective management and the application of proactive procedures, rather than reactive. The main issue in disaster risk reduction implies that efforts should be to build resilience to disasters, and there should be a sense of adequate commitment, urgency and use of predictable resources to prepare for disasters and reduce their risk (Quarantelli, 1998b; Maben et al., 2010).

Al-Qahtani (2014) explains that although there is a political willingness in the Saudi government to reduce the impacts of disasters, unfortunately very little has been done in the kingdom for disaster risk reduction. The Saudi government has shown international cooperation for disaster risk reduction and adopted the recommendations of the Hyogo

Framework for Action and the Arab Strategy for Disaster Risk Reduction 2020. Through its effective role in the Gulf Cooperation Council (GCC), Saudi Arabia and the member states in the GCC adopted proactive measures and a road map for disaster risk reduction.

4.4.2.1 Saudi National Plan to Face Natural Disasters (Ministry of Municipal and Rural Affairs, 2009)

As mentioned above, the efforts of the kingdom for disaster risk reduction are reactive rather than proactive. Therefore, the Saudi government has a national response plan to face natural disasters when they occur. This section illustrates the plan and how it works.

The plan has a list of natural disasters that might occur in the kingdom. It includes floods, flash floods, heavy rain, hurricanes, storms, dust, landslide, cracks in the ground, ground collapse, building damage, dam collapse, earthquakes, volcanic activities and epidemics. When a disaster takes place or about to take place, the Civil Defence informs the Saudi Ministry of Interior and the Minister of the Interior is the only person who has the authority to declare a natural disaster in the kingdom.

The national plan for the management of natural disasters in the kingdom is divided into three main stages: before disaster, during disaster and after disaster. The before disaster stage focuses on taking protective procedures to predict natural disasters and face them. The plan in this stage focuses on the following points:

- 1- Conduct studies to show the possible natural disasters and their impacts.
- 2- Take protective procedures to mitigate the risks of natural disasters; issue laws and safety requirements for buildings and factories; Apply the Saudi Building Code and take the required procedures to ensure the implementation of laws.
- 3- Educate the public through the different means of media about what should done to reduce the risks of natural disasters.
- 4- Prepare a suitable plan to face natural disasters and this plan should take into account the available mechanic and human abilities and the tasks of the different parties involved in the plan.
- 5- Train individuals and groups at all levels to take their pre-planned roles when a disaster takes place.

- 6- Conduct virtual and trial application of the plan to test its efficiency and the readiness of the involved parties.

The second stage of the plan is when a natural disaster takes place. The plan considers this stage to be very critical because it is the actual application of the response plan and many incidents and surprises might unfold. This stage focuses on the following factors:

- 1- Immediate response and application of the pre-prepared emergency plan.
- 2- Request mechanic and human support if there is any need.
- 3- Supply the affected area with the urgent required materials and needs (e.g., food, shelter, clothes, medicine and security).
- 4- Follow-up any new changes in the natural disaster and report it directly.

The third stage in the national plan is after the natural disaster takes place. This stage is related to the effectiveness of the previous two stages. The focus in this stage is on the following factors:

- 1- Apply the plan for rehabilitation in the affected area and this plan should clarify the target objectives and priorities in this stage.
- 2- Assign one leadership to supervise the process of rehabilitation and review the progress of the pre-prepared plans.
- 3- Form different work teams to implement the rehabilitation plan.
- 4- Lessons to be learned from the natural disaster.

There are many parties involved in the implementation of the national plan to face natural disasters in the Kingdom of Saudi Arabia. These parties are:

- 1- Ministry of Interior
- 2- Ministry of Defense
- 3- Ministry of Municipal and Rural Affairs
- 4- Ministry of National Guards
- 5- Saudi Commission for Tourism and National Heritage
- 6- Saudi Red Crescent
- 7- Ministry of Education

- 8- Ministry of Finance
- 9- Ministry of Energy Industry and Minerals
- 10- Ministry of Health
- 11- Ministry of Water and Electricity
- 12- Ministry of Trade and Industry
- 13- Ministry of Transportation
- 14- Ministry of Social Affairs
- 15- Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance
- 16- Ministry of Culture and Information
- 17- Ministry of Communications and Information Technology
- 18- Ministry of Economy and Planning
- 19- Presidency of Meteorology & Environment
- 20- Any other needed party

Each of the above-mentioned parties has its own pre-agreed responsibilities and tasks to be implemented in the different stages of the national plan. For example, the Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance has two basic roles in the national plan: first, it coordinates with the General Directorate for Civil Defence to identify some mosques that can be used for shelter in emergencies. Second, the Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance, in coordination with the Civil Defence, forms team works to supervise mosques that will be used as shelters during disasters. However, the large number of involved parties in DRR in KSA, in the researcher's opinion, makes coordination between these various parties very slow meaning that approaches to DDR are likely to be ineffective.

4.4.2.2 Previous Studies on the Effectiveness of Disaster Risk Reduction in the Kingdom of Saudi Arabia

Jeddah flood 2009 was the most destructive natural disaster in the history of the Kingdom of Saudi Arabia. Abosuliman et al. (2013) investigated the level of preparedness and management in Saudi Arabia to face disasters. The researchers conducted a questionnaire on the officials involved in disaster management. The study aimed to obtain information about the readiness and preparedness of disaster and emergency organizations to face floods occurred in Jeddah between 2009 and 2010. The officials interviewed in this research represent between one quarter and one third of the officials in these organisations that are directly connected with

disaster management. Table 4.4 shows the quality response of Saudi Civil Defence between 2009 and 2010.

Table 4.4: Quality of Response of Civil Defence Organization (Abosuliman et al. 2013: 297)

Year	Item	W.A. ⁴ N=30 ⁵	S.D. ⁶	Ranking
2009	Response time	2.778	1.500	1
	Efficiency	2.776	1.066	2
	Resources	1.949	1.000	4
	Cost structure	1.998	1.333	3
2010	Response time	2.001	1.100	3
	Efficiency	2.112	1.033	1
	Resources	1.991	1.333	4
	Cost structure	2.111	1.666	2
2009		2.375	1.224	
2010		2.530	1.283	

As is shown in the Table 4.4, the participants were less satisfied with the response of Civil Defence in 2009 (2.375) compared to the higher response satisfaction in 2010 (2.530). In 2009, *response time* was at a high interest (W.A. 2.778, S.D. 1.500), while *resources* available was at the lowest interest level (W.A. 1.949, S.D. 1.000). In 2010, in contrast, *efficiency* was at the highest interest (W.A. 2.112, S.D.1.0333), while *resources* available was the lowest interest level (W.A. 1.991, S.D. 1.333).

In comparison to the quality response of Saudi Civil Defence, Table 4.5 shows the quality response of Saudi Red Crescent between 2009 and 2010.

Table 4.5: Quality of Response Red Crescent in Saudi Arabia (Abosuliman et al. 2013: 297)

Year	Item	W.A. (N=30)	S.D.	Ranking
2009	Response time	2.500	1.581	1
	Efficiency	1.889	1.666	4
	Resources	1.904	1.833	3
	Cost structure	2.000	1.003	2
2010	Response time	3.166	0.888	2
	Efficiency	3.5000	0.667	1
	Resources	2.833	1.007	3
	Cost structure	2.333	1.223	4
2009		1.999	1.594	
2010		2.958	0.946	

⁴ Weighted Average

⁵ Number of participants

⁶ Standard Deviation

Similar to the opinion of participants about the quality of response of Saudi Civil Defence, the participants were less satisfied with the response of Red Crescent in 2009 (1.999) compared to the higher response satisfaction in 2010 (2.985). In 2009, *response time* was at a high interest (W.A. 2.500, S.D. 1.581), while *efficiency* was at the lowest interest level (W.A. 1.889, S.D. 1.666). In 2010, in contrast, *efficiency* was at the highest interest (W.A. 3.500, S.D. 0.667), while *cost structure* was the lowest interest level (W.A. 2.333, S.D. 1.223).

Table 4.6 shows the responses of participants about the quality of response of local emergency groups in Saudi Arabia:

Table 4.6: Quality of Response of Local Emergency Groups in Saudi Arabia (Abosuliman et al. 2013: 298)

Year	Item	W.A. N=30	S.D.	Ranking
2009	Response time	1.833	1.353	3
	Efficiency	1.666	1.290	4
	Resources	1.966	1.402	2
	Cost structure	2.168	1.366	1
2010	Response time	3.833	0.957	1
	Efficiency	3.166	1.033	3
	Resources	3.300	1.002	2
	Cost structure	2.566	1.887	4
2009		1.707	1.553	
2010		3.216	1.219	

As is shown in Table 4.6, the participants were less satisfied with the response of local and national emergency groups in 2009 (1.707), compared to the higher response satisfaction in 2010 (3.216). In 2009, *cost structure* was at a high interest (W.A. 2.168, S.D. 1.366), while *efficiency* was at the lowest interest level (W.A. 1.666, S.D.1.290). In 2010, in contrast, *response time* was at the highest interest (W.A. 3.833, S.D. 0.957), while *cost structure* was the lowest interest level (W.A. 2.566, S.D. 1.887).

In addition to the quality of response, the researchers investigated the preparation for disaster by the Saudi Civil Defence, Red Crescent and Local Emergency Groups. Table 4.7 shows participants' opinions about the preparation of Saudi Civil Defence for disasters between 2009 and 2010.

Table 4.7: Preparation for Disaster Response by Civil Defence in Saudi Arabia (Abosuliman et al. 2013: 298)

Year	Item	W.A. N=30	S.D.	Ranking
2009	Funding	2.000	1.445	4
	People	4.000	0.305	3
	Training	5.000	0.101	1
	Coordination	5.000	0.112	2
2010	Funding	2.000	1.433	4
	People	5.000	0.110	1
	Training	5.000	0.117	2
	Coordination	5.000	0.201	3
2009		4.000	0.490	
2010		4.250	0.436	

As is shown in the Table 4.7, the participants were less satisfied with the preparation of Civil Defence in 2009 (4.000), compared to 2010 (4.250). In 2009, *training* (5.000, S.D. 0.101) and *coordination* (W.A.5.000, S.D. 0.112) were very important, while *people availability* (W.A. 4.000, S.D. 0.305) and *funding* (W.A. 2.000, S.D. 1.445) were of less importance. In 2010, in contrast, *people* (W.A. 5.000, S.D. 0.110), *training* (W.A. 5.000, S.D. 0.117), and *coordination* (W.A. 5.000, S.D. 0.201) were of high importance, while *Funding* in the disaster planning phase was last (W.A. 2.000, S.D. 1.433).

In comparison to the preparation of Saudi Civil Defence, Table 4.8 shows participants' opinions about the preparation of Saudi Red Crescent for disasters between 2009 and 2010.

Table 4.8: Preparation for Disaster Response by Red Crescent in Saudi Arabia (Abosuliman et al. 2013: 298)

Year	Item	W.A. N=30	S.D.	Ranking
2009	Funding	2.000	1.414	4
	People	4.000	0.998	3
	Training	5.000	0.301	2
	Coordination	5.000	0.112	1
2010	Funding	2.000	1.512	4
	People	5.000	0.222	2
	Training	5.000	0.189	1
	Coordination	5.000	0.300	3
2009		4.000	0.706	
2010		4.250	0.555	

As is shown in the Table 4.8, the participants were less satisfied with the preparation of Red Crescent in Jeddah in 2009 (4.000), compared to 2010 (4.250). In 2009, *coordination* (W.A. 5.000, S.D. 0.112) and *training* (W.A. 5.000, S.D. 0.301) were very important, while *people availability* (W.A. 4.000, S.D. 0.998) and *funding* (W.A. 2.000, S.D. 1.414) were of less importance. In 2010, in contrast, *training*, *people* and *coordination* similarly (W.A. 5.000; S.D.s. 0.189, 0.222 and 0.300 respectively) were of high importance, while *Funding* in the disaster planning phase was last (W.A. 2.000, S.D. 1.512).

Table 4.9 shows participants' opinions about the preparation of Local Emergency Groups for disasters between 2009 and 2010.

Table 4.9: Preparation for Disaster Response by local emergency response groups in Saudi Arabia (Abosuliman et al. 2013: 299)

Year	Item	W.A. N=30	S.D.	Ranking
2009	Funding	4.966	0.344	4
	People	5.000	0.003	1
	Training	5.000	0.011	2
	Coordination	5.000	0.022	3
2010	Funding	4.633	0.422	4
	People	5.000	0.004	1
	Training	5.000	0.110	3
	Coordination	5.000	0.014	2
2009		4.991	0.095	
2010		4.908	0.137	

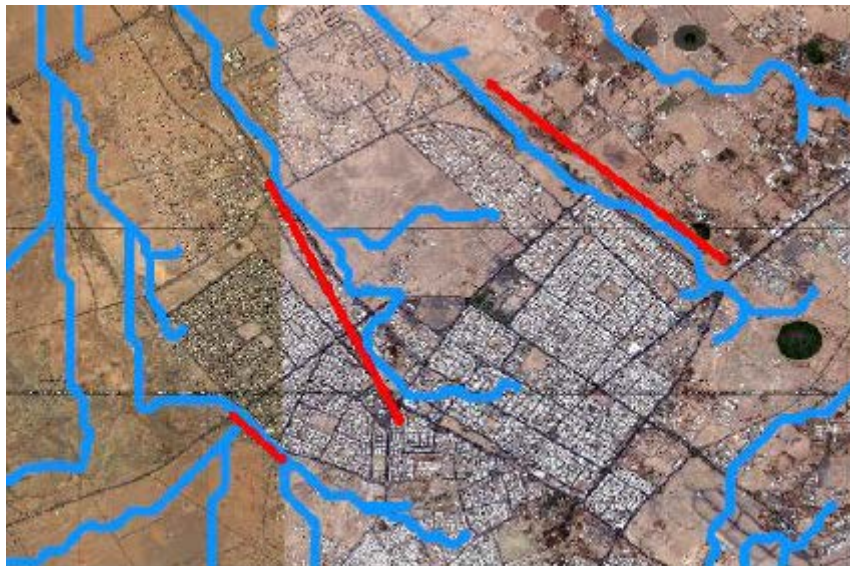
As is shown in the Table 4.9, the participants were slightly more satisfied with the preparation of local emergency response groups in Jeddah in 2009 (4.991), compared to 2010 (4.908). In 2009, people, training and coordination (W.A. 5.00 and S.D.s respectively 0.003, 0.011 and 0.022) were very important, while funding (W.A. 4.966, S.D. 0.344) was of less importance. In 2010, in contrast, people, coordination and training (W.A. 5.00 and S.D.s respectively 0.004, 0.014 and 0.110) were of high importance, while funding (W.A. 4.633, S.D. 0.442) was of less importance.

Based on the above results, Abosuliman et al. (2013) concluded that participants largely agreed on the main five areas for disaster risk reduction in the case of floods: training of response teams, identification and coordination of the organizational responsibilities and community

awareness and preparedness. Importantly, people acknowledged the effects of natural disasters and they were aware of them, but they lacked community-based bodies to organize their efforts and participation. The researchers stressed that further research is required to investigate the progress of policy initiatives, especially the well-coordination of organizations to manage disasters among the population.

Al-Momani and Shawaqfah (2013) used a Digital Elevation Model (DEM), which is a very significant source of information for spatial modelling and monitoring, to study the possible locations of flash floods around the city of Tabuk in the northern west side of Saudi Arabia. Based on the DEM data, it was found that hazardous floods are highly possible in large residential areas in the city, as is illustrated by red lines in Figure 4.8.

Figure 4.8: Expected hazardous flood location in Tabuk (Al-Momani and Shawaqfah, 2013: 26)



To mitigate the effects of possible floods in these areas, Al-Momani and Shawaqfah (2013) suggested a rigorous approach which includes restricting new development activities in the area, control of land use in the basin area, removal of some physical structures from the flood pathway and designing a catchment planning approach for adaption to flood.

Azim and Islam (2016) investigated the perception and preparedness for natural disasters, namely earthquakes in the Kingdom of Saudi Arabia, particularly in the city of Jeddah which

is geographically prone to earthquakes. A questionnaire was conducted on 555 participants to study the effects of age, gender and education on the perception of natural disasters in the kingdom. The researchers found that the majority of participants did not have much knowledge and information about natural disasters, their impacts and how to mitigate their risks. Therefore, they were not worried about the break out of earthquakes, in particular, or any other disaster in the Kingdom of Saudi Arabia. The majority of participants in the study (68.5%) were 'Not prepared at all' while only 31.5 percent of participants were somewhat prepared to face the risks of earthquakes. Surprisingly, no one was well prepared to face the risks of earthquakes. The researchers found the younger participants and well-educated participants considered themselves more prepared than older participants and low educated participants, respectively. As for gender differences, the majority of male participants considered themselves more well-prepared than female participants although not at a significant difference, and female participants showed low perception of the risk of natural disasters compared with male participants. The researchers ascribed the low perception and preparedness for natural disasters to religious reasons because some participants refused to answer some questions and overwrote something like 'Allah is All-knowing' (AllahuAlim), 'How can I know something unseen' (gaib), or 'I cannot answer this question. However, the researchers did not mention whether these participants were low educated or highly educated. Importantly, Azim and Islam (2016) found that the majority of participants in their study strongly believed that protective procedures can reduce the risks of natural disasters, which made the researcher argue that their results are against the Islamic fatalistic view of natural disasters.

Other studies focused on man-made hazards in the Kingdom of Saudi Arabia. For example, Al-Qahtani (2014) studied the impacts of petrochemical hazards on the Kingdom of Saudi Arabia, particularly in Jubail city and its residents, and the preparedness of the kingdom to face potential risks that result from oil, which represents about 80 percent of the total revenues in the kingdom.

The research methodology was semi-structured interviews with stakeholders in the city and employees in the Saudi Arabia Civil Defence in the city of Jubail. In particular, only leaders and managers were selected as participants in the study. The study area contains a cluster of

petrochemical industries, including Saudi Aramco Shell Refinery Company (SASREF) within the Saudi Arabia's petrochemical industry producing approximately 305,000 barrels of oil per day. In clear terms, Jubail industrial city contains about 42.5 petrochemicals, around 17.7 refinery oil and approximately 9.4 Iron million tons per year respectively (Kingdom of Saudi Arabia - Central Department of Statistics, 2012).

The results showed that there was not much attention about disasters preparedness, state preparedness, resilience, communities' response capacity and the effects of petrochemical disasters on the environment. Hence, there is a critical need of concentrating on disaster effects and disaster risk reduction. Participants admitted that there were some measures to face disasters, but they could not tell whether these measures are proactive. As for regulations, the participants said that there were effective regulations for managing disasters and emergencies.

The participants rated disaster preparedness below average because the policies of the government to face disasters were seen as a reactive in nature. Adaption to disasters was found to be very low because of many factors such as poverty, literacy level and discourse in government policy. Therefore, adaption to disasters depended on the vulnerability of affected people. The researcher suggested that the organizations and government are able to help by redirecting policy on disaster risks education and communication, disaster risks reduction programme and focus on eliminating activities that directly affect the environment.

Based on the fact that the Kingdom of Saudi Arabia has witnessed many disasters that have had considerable financial and human effects on the Kingdom, there should be effective management of disaster risks. Pararas-Carayannis (2013) argues that if the aim is to assess the possible risks and hazards in the Kingdom of Saudi Arabia, there should be good understanding of the physics of every kind of disaster and collection of possible information about the history of the disaster in the past and the present. Such data should be carefully analysed and interpreted to expect the future impacts of disasters. Once the data is collected and analysed, there should be serious work on an effective disaster mitigation strategy which focuses on the application of the right scientific tools for management and planning. Work should also focus on raising public awareness and educating people about the impacts of disasters and the

importance of their participation in disaster risk reduction. Therefore, public awareness of what happens in disasters and what is their role are very important in disaster mitigation.

Availability of information to officials and the public about the effects of disasters and the appropriate tools for assessment is very important for the proper mitigation of disasters. Such information, which is usually issued by local and national authorities, should be available in advance and it should inform the people involved about the type of disaster, its possible location and damages. The better available information in advance, the best results are expected for disaster risk reduction.

Better assessment techniques, management strategies and tools are very important to strengthen the societal and economic resilience of the Kingdom of Saudi Arabia for disaster risk reduction. Of course, the first step should be the identification of the potential risk and the vulnerability of the area.

In an analysis of the floods in Jeddah and Riyadh 2009-2010, Alamri (2011: 311-312) discussed some lessons and suggested some solution to mitigate the effects of disasters in the Kingdom. Lessons from Jeddah and Riyadh floods are:

Lesson one: Although many floods have impacted the Kingdom, after they have passed people go back to their life as normal because they believe that “what Allah decrees to happen, will happen, and we cannot do anything about it.”

Recommendation one: People should learn from previous disasters in order to make better decisions in future disasters. Islam encourages us to take proactive role. Our prophet Mohammad says “trust in Allah, but tie your camel.”

Lesson two: there is dangerous fragmentation in the coordination between different parties involved in disaster management in emergency. Emergency management in KSA is reactive, rather than proactive. Because of the absence of coordination, affected people did not know who to contact or what to do.

Recommendation two: Different parties should agree on a plan and a strategy in advance. Therefore, a local organizing body, which coordinates between different involved parties, should be formed and an emergency contact number should be dedicated to the public.

Lesson Three: previous disasters, especially Jeddah flood 2009, showed basic understanding of disasters because in 2009 the underground of King Abdulaziz Hospital was submerged with water.

Recommendation three: if the geography of the area is better understood, there will be better predictions of the potential damage if a disaster occurs. Therefore, if the infrastructure of the area is well studied and prepared to face disasters, fewer adverse effects are predicted to happen in the future.

Lesson four: Although a large number of locals wanted to volunteer and help, the majority of them did not know what to do, and sometimes they hindered the work of rescue teams.

Recommendation Four: there should be one organized agency for all volunteers who should follow its instructions and benefit from the training it provides. Jeddah Friends has been recently approved by the Governorate.

Momani and Fadil (2010: 428) suggested some procedures and measures to overcome obstacles and mitigate any future disasters, such as floods, in the Kingdom of Saudi Arabia:

- Activating the role of maintenance of equipment and streams of rainfall in the rainy seasons and the use of meteorological and environmental protection in periods of rainfall in the province of Jeddah.
- The Association of Meteorology and Environmental Protection must pursue a new approach in the process of notification and warning of rain and floods, so that affected communities could be warned before a disaster strikes.
- Preparation of hydrological studies to address the tendencies surface when creating new roads and maintenance of the old ones.

- Develop awareness programs for preventing the dangers of rain and floods and activating the role of the community.
- Review all regulations and plans related to the natural and man-made disasters management in the Kingdom.
- Review and study all of the issued regulations related to urban planning, particularly with regard to identifying the urban boundaries of each city to identify shortcomings both in the regulations or the application.
- Establishment of a national anti-corruption institutions which does not interfere with government ministries and non-governmental organizations in its study where it will completely independent financially and administratively to monitor projects and the budget of these institutions and government ministries.

Barau and Ludin (2013) summarize five stages for the evolution and management of disasters. These stages, which can be applied in the Kingdom of Saudi Arabia, are illustrated in Table 4.10.

Table 4.10: Stages of disaster evolution and management (Barau and Ludin, 2013: 713)

	Notionally normal starting point:
Stage I	(a)Initial culturally accepted beliefs about the world and its hazards. (b)Associated precautionary norms set out in laws, codes of practice, mores and folkways.
Stage II	Incubation period: the accumulation of an unnoticed set of events which are at odds with accepted beliefs about hazards and the norms for their avoidance.
Stage III	Precipitating event: forces itself to attention and transforms general perceptions of Stage II.
Stage IV	Onset: the immediate consequences of the collapse of cultural precautions become apparent.
Stage V	Rescue and salvage — first stage adjustment: the immediate post-collapse situation is recognized in ad hoc adjustments which permit the work of rescue and salvage to be started.
Stage VI	Cultural readjustment: an inquiry or assessment is carried out and beliefs and precautionary norms are adjusted to fit the newly gained understanding of the world.

As can be seen from Table 4.10, people approach disasters with their existing beliefs and thoughts about disasters, and they issue laws based on their beliefs. However, some different unnoticed events, which challenge their beliefs about disasters, happen and cause disasters. Therefore, beliefs and norms are re-considered according to the new disaster. Cultural beliefs

are adjusted and people start the rescue process and new planning to reduce the effects of potential future disasters.

Most importantly, when a disaster breaks out, it is not the time to apply something different from the normal procedures and arrangements, which are usually applied in disasters because new unknown procedures might cause confusion, especially if there is lack of knowledge about the new procedures. Although expected success is not guaranteed, disaster preparedness is very important because it gives confidence to practitioners and increases the level of cooperation between rescue teams.

4.5 Summary

This chapter reviewed very important information about the Kingdom of Saudi Arabia in terms of background information, culture and traditions, different types of hazards in the kingdom, vulnerability of the kingdom to natural hazards and the national, regional and international efforts of the kingdom in disaster risk reduction.

An overview of the Kingdom of Saudi Arabia shows it is the largest country in the Arab peninsula. It is one of the major exporters of oil. It is a major holy place for all Muslims. The direction of prayer is the Kabaa in Makkah. Further, Islam requires that all Muslims, where possible, undertake Hajj and Umrah. This means Muslims worldwide hope that they can visit the Kingdom of Saudi Arabia at least once in their lives.

This chapter has also shown that the Saudi culture is different from other countries in the region, and it is affected by Islamic traditions at all levels in life. The Kingdom of Saudi Arabia has its own special culture, which is distinguished from the surrounding countries. The culture of the Kingdom of Saudi Arabia is mainly influenced by Islam and the history of the kingdom. In particular, gender issues were shown to be very sensitive in the Saudi culture where there is complete segregation between males and females at all levels in life, especially at work and study levels.

The most common man-made hazards in the Kingdom of Saudi Arabia, as was shown in this chapter, are terrorist attacks, motor vehicle crashes, Umrah and Hajj season and technological hazards. As for natural hazards, the discussion in this chapter has shown that different parts of the Kingdom of Saudi Arabia are prone to different types of natural hazards. For example, volcanic and earthquake hazards are common in the north western part of the kingdom (Tabuk and Madinah provinces), while the western and central provinces of the kingdom (Makkah and Riyadh) are exposed to floods. Landslides are common in the southern western mountain areas of the kingdom (Asir and Jazan provinces). Dust storms are a critical hazard in the whole provinces of the kingdom, especially in the central and eastern regions.

The history of natural hazards was reviewed in this chapter, showing that different types of natural hazards have occurred in the Kingdom, especially floods which have been very frequent in the last decade leading to serious human impacts and economic impacts in the kingdom. For example, Jeddah 2009 flood has been the most destructive recorded flood in the Kingdom of Saudi Arabia leading to the death of 163 people, injury of 11,640 people very important economic impacts in the kingdom.

However, the efforts of the Kingdom of Saudi Arabia in disaster risk reduction has been very slow in developing emergency logistics systems. Many man-made disasters and natural disasters have occurred in the kingdom, but very little has been done in terms of disaster preparedness. As was shown in the discussion in this chapter, the efforts of the Saudi government in disaster risk reduction have been mainly reactive rather than proactive.

Chapter Five: Research Methodology

5.1 Introduction

Research is a term that is commonly used in everyday activities, ranging from collecting different kinds of information to producing new products. However, this common use of the word research is different from what is used in the academia. Williman (2011) explains that the term research is wrongly used in different ways. For example, the term research is looked at as a mere gathering of information where a person who does the research quickly reads some books or surf the internet to have better knowledge about the topic of interest. Williman (2011) argues that such an activity is called ‘collection of information’ rather than research. Another example of a common wrong usage of the term research in everyday activities is when it is used to refer to facts which are moved from one situation to another. In this case, the researcher does some research about the topic and comes with new information, which might be published in a new paper. However, Williman (2011) explains that such a case is called ‘assembly of information’ rather than research because interpretation of information is an important part of the research process. Surprisingly, some people might use the term research indirectly to advertise their products. Every day we watch on the TV that after many years of research about this problem, company X found a magic solution, which is their new product.

In contrast to what is mentioned above about research, research in academic institutions has a systematic process, procedure and purpose. Research is defined by the Oxford Encyclopaedic English Dictionary as:

- a. the systematic investigation into the study of materials, sources etc. in order to establish facts and reach new conclusions
- b. an endeavor to discover new or collate old facts etc. by the scientific study of a subject or by a course of critical investigation. (OEED, 1991, p. 1228)

Research is defined by Leedy (1989: 5) as “a procedure by which we attempt to find systematically, and with the support of demonstrable fact, the answer to a question or the resolution of a problem.” Habib et al. (2014: 4) say, “Research is the collection and interpretation of data in an attempt to resolve a problem at hand or to answer a question.” Mack et al. (2005: 1) explain that a scientific research is generally an investigation that:

- seeks answers to a question
- systematically uses a predefined set of procedures to answer the question
- collects evidence
- produces findings that were not determined in advance
- produces findings that are applicable beyond the immediate boundaries of the study

As is said above, research involves collection and interpretation of information to resolve a problem or answer a question. Importantly, Habib et al. (2014) explain that the process of research is systematic and follows a certain methodology, which has specific stages. The first stage involves defining the problem of the research. In this stage, the researcher usually does an extensive search for information about a topic, narrows down the topic and comes with research questions that need to be answered to produce better outcomes. The second stage is setting the hypothesis, which is usually based on the research questions defined in the first stage. The hypothesis can be either alternate or null, and it guides the research throughout the subsequent stages of the research. The third stage involves data collection which can be done in different ways according to the quantitative or qualitative nature of the research, as is explained in Section 5.4. The fourth stage involves testing the hypothesis, which is set in the second stage. In this stage, the researcher analyses the data, which is collected in the third stage to either confirm or disconfirm the research hypothesis. The fifth and last stage is the conclusion stage where the researcher reaches to apparent findings of the research and suggests applications and recommendation to resolve the research problem that is defined in the first stage.

In this study, the researcher already discussed the first and second stages of research process, namely defining the problem, in Chapter One. This chapter discusses stage three of the research process, in particular the data collection and analysis process. Therefore, this chapter presents the methodology adopted in this study. It discusses the philosophical assumptions, epistemological and ontological, underpinning natural research, and justifies a subjective qualitative approach for this study. The researcher considers this study to be an interpretive, qualitative, and exploratory one. As the intellectual basis for any research should be discussed and clearly presented, the epistemological and philosophical issues in this study are discussed in Section (5.3). In particular, this study discussed positivism, interpretivism, quantitative

research, qualitative research, exploratory research, explanatory research, voluntarism and determinism.

The research plan adopted in this research involved: review of the previous research about the topic, theoretical development of the concept, research questions and objectives, data collection and analysis. Questionnaires, interviews and focused groups are discussed as data collection methods that were used in this study. Finally, data scoring and analysis are discussed.

5.2 Research Objectives

The aim of the research, as mentioned in Section 1.4, is to evaluate current approaches to disaster risk reduction in the Kingdom of Saudi Arabia and examine the actual and potential role of Islamic teaching in the perception and reduction of the risks of natural disasters. The research has the following objectives:

- 1- To investigate the perception and preparedness Saudi citizens to face weather related natural disasters in the Kingdom of Saudi Arabia
- 2- To analyze the efforts of the Kingdom of Saudi Arabia in disaster risk reduction
- 3- To evaluate the concept of natural disasters in Islam
- 4- To investigate the role of Islam in disaster risk reduction
- 5- To make recommendations to incorporate Islamic teachings into the policies and strategies of disaster risk reduction in the Kingdom of Saudi Arabia

5.3 Research philosophy

Research should be based on certain clear philosophical beliefs that guide the researcher throughout the study. In this regard, ontology and epistemology play an important role in the methodology of research. To start with ontology, there are two main paradigms: realism and nominalism. Realism sees the social world as made of concrete real structures which exist before the existence of individuals' knowledge (Burrell and Morgan, 1979). A nominalist approach, on the other hand, views the world as social constructions which are formed of concepts and names that are used as tools to study and describe the world (Ciborra, 1998). In the light of disaster knowledge and management, people are mainly concerned in shaping and constructing many realities in society. Therefore, it is highly important to investigate people's

perceptions of disasters and what decisions they take according to their assumptions. Thus, nominalist ontology is suitable for such a research.

In addition to ontology, a researcher should decide the epistemological stance of research to decide the way knowledge is obtained and analysed. Similar to ontology, there are two common approaches in epistemological stance: positivism and interpretivism (Creswell, 2003). The former sees the world as a reality which can be understood through scientific mathematical and logical treatments while the latter sees the scientific measures of natural sciences not suitable when human beings are concerned because people are subjective in their interpretations (Braa and Sorgaard, 1997).

Different people interpret disasters in different ways according to their experiences, perceptions and beliefs. A study of disaster should take into consideration the description, understanding and perception of people involved in disaster management. Therefore, an interpretivist epistemology is more convenient in such studies. All in all, this research adopts nominalist ontology and interpretivist epistemology.

5.4 Quantitative and Qualitative Analysis

There is no clear distinction between qualitative and quantitative approaches. Berg (2009) points out that quantity refers to the amount of something where the counts and measures of things are important. Quality, on the other hand, refers to the nature of things where the questions of when, where, what and how are very important. Qualitative approaches are preferred when some certain experiences cannot be discussed and expressed in numbers and measures. Instead, the researcher should observe people, go deep into their life, and understand the secrets of their behaviour. Similarly, Henwood (1997) says that a quantitative approach looks to manipulate, measure and decide the relation between many variables to test the validity of a hypothesis. In a qualitative approach, on the other hand, the interest is more in understanding the meanings of experiences, participants, events and actions, which are interpreted through the understanding of the researcher to reach meaning. Corbin and Strauss (2008) also illustrate that qualitative approaches allow the researcher to go deep into the experiences of participants to understand how events occur in culture and discover rather than test variables. What is important about qualitative approaches is that they consider not only what people say, but also what is not said and body language. A comprehensive comparison

between quantitative and qualitative research is discussed by Mack et al. (2005: 3), as is shown in Table 5.1.

Table 5.1: Comparison of quantitative and qualitative research approaches (Mack et al, 2005)

	Quantitative	Qualitative
General framework	<p>Seek to confirm hypotheses about phenomena</p> <p>Instruments use more rigid style of eliciting and categorizing responses to questions</p> <p>Use highly structured methods such as questionnaires, surveys, and structured observation</p>	<p>Seek to explore phenomena</p> <p>Instruments use more flexible, iterative style of eliciting and categorizing responses to questions</p> <p>Use semi-structured methods such as in-depth interviews, focus groups, and participant observation</p>
Analytical objectives	<p>To quantify variation</p> <p>To predict causal relationships</p> <p>To describe characteristics of a population</p>	<p>To describe variation</p> <p>To describe and explain relationships</p> <p>To describe individual experiences</p> <p>To describe group norms</p>
Question format	Closed-ended	Open-ended
Data format	Numerical (obtained by assigning numerical values to responses)	Textual (obtained from audiotapes, videotapes, and field notes)
Flexibility in study design	<p>Study design is stable from beginning to end</p> <p>Participant responses do not influence or determine how and which questions researchers ask next</p> <p>Study design is subject to statistical assumptions and conditions</p>	<p>Some aspects of the study are flexible (for example, the addition, exclusion, or wording of particular interview questions)</p> <p>Participant responses affect how and which questions researchers ask next</p> <p>Study design is iterative, that is, data collection and research questions are adjusted according to what is learned</p>

Based on this thorough comparison between quantitative and qualitative research approaches, it can be said that quantitative research is fairly flexible. The researcher uses the same research tools, say a questionnaire, and asks all the participants the same questions which have fixed answers or options. As discussed by Mack et al. (2005: 3), “The advantage of this inflexibility is that it allows for meaningful comparison of responses across participants and study sites. However, it requires a thorough understanding of the important questions to ask, the best way to ask them, and the range of possible responses.” Qualitative research, in contrast, is more flexible because it gives more room for interaction between the researcher and participants. Participants are usually asked open-ended questions that does not need the same wording from all participants, so participants have the freedom in their answers to express their opinions. In this case, participants have the chance to respond more elaborately and the researcher has the chance to respond immediately to their questions and concerns and ask more questions based on their answers. A qualitative research method is an interactive means between the researcher and participants.

The most important characteristic of qualitative research is that it facilitates the process of meaning making. When studying people and their lives, meaning making is difficult because meaning is assigned to different people and objects in various ways (Krauss, 2005). In this regard, Erikson (1963) divided meaning into two main categories: unique meaning and common meaning. However, this distinction does not have clear boundaries because what is common meaning to one group might mean unique meaning to another group. Therefore, understanding unique meaning depends on the understanding of the factors that have an effect on it. Interestingly, the meaning that qualitative research looks for is unique meaning because it looks to decide the contributors to the unique meaning of groups or individuals (Krauss, 2005).

The current study investigated the socio-cultural and environmental factors that can affect the perception of natural disasters. In particular, the role of Islam and traditional values in the perception and reduction of natural disasters in the Kingdom of Saudi Arabia were investigated in this study. Therefore, there was a need for a holistic approach that deals with concepts and perceptions rather than numbers. The researcher felt that a qualitative approach allows the use a variety of research tools, such as questionnaires, interviews and observations, in order to form a better understanding of the phenomenon under investigation. Therefore, a qualitative

approach was adopted for the assessment of weather-related natural disaster in the Kingdom of Saudi Arabia and the role of Islamic teachings in the perception and reduction of the risks of natural disasters.

5.5 Human Nature

How human beings see the world is determined by the relationship between human nature and behaviour which are seen as a continuum with two ends: determinism and voluntarism (Easterby-Smith et al., 2002). The argument in the deterministic approach is that the humans' actions are the products of their nature, while the voluntaristic approach states that human beings have a free will and they create nature (Powers, 1998).

There are two common theories that explain the relationship between decision-making and human activity: the subjective expected utility theory and the bounded rationality theory. Simon (1983) points out that the subjective expected utility theory assumes human activity is rational while the decision maker chooses from a certain set of options and perceives an accurate prediction of outcomes for all alternative scenarios. In the case of the bounded rationality theory, in contrast, people are processors of serial information because they cannot process more than one piece of information at a time, and they cannot focus on all of the options required to take a decision at once and take a decision based on the perception of which decision opportunity is of the highest priority at that time.

The stance adopted in this study is that the nature of human individuals is deterministic and voluntaristic, and the world is constructed by humans and determined by the environment to a certain degree. Such assumption is very important in this research because it shows that humans and the environment are considered in any decision taken with regards to natural disasters.

5.5 Research Ethics

The origin of ethics goes back to the Greek philosophy of moral life (Fouka and Mantzourou, 2011). Ethics is a branch of philosophy which is concerned with the dynamics of decision making in terms of what is wrong and what is right (Fouka and Mantzourou, 2011). The interest in ethics in research started in the 1940's with the exploitation of human beings in many cases and situations. Because of the Nazi experiments at that time, the Nuremberg Code (1947) was introduced at that time and followed by many codes to protect people. Fouka and Mantzourou

(2011: 4) explain that the Nuremberg Code (1947) “focuses on voluntary informed consent, liberty of withdrawal from research, protection from physical and mental harm, or suffering and death. It also emphasises the risk- benefit balance.”

Before participants take part in the research, they should consent to participate in the study. Informed consent, which is usually reviewed by the research board, is a very important part of the research process. Armiger (1997: 332) says that informed consent "means that a person knowingly, voluntarily and intelligently, and in a clear and manifest way, gives his consent" A consent should be voluntary and the participant should know in advance the required role and the conduct of the research (Connelly, 2014). Importantly, the participants always have the right to withdraw from the study. If the participant knows in advance the risks and benefits of his participation in the research, he will be able to decide whether to participate in the study or not. Fouka and Mantzorou (2011) argue that a consent form should include an introduction to the study, importance of the study, followed procedures and possible harm or discomfort to the participant. Fouka and Mantzorou (2011) say that special care should be paid to vulnerable people, such as children, prisoners and older people. In the case of children under the age of 18, one of the parents can give consent. Sometimes, researchers can get the consent of participants indirectly, as Connelly (2014: 54) explains “In some cases, such as with surveys, consent may be implied if participants complete the survey. Nonetheless, information about the conduct of the study is shared with the participants, often as part of the survey instructions.”

In addition to research approval and participants’ consent, participants’ recruitment is also a very important issue. There should be no coercion at all in the recruitment of participants. Participants should not think in advance that they must participate in the study because someone asked them to do so. On the contrary, participant should know from the very beginning that they have the full freedom to refuse to participate in the study, and such a refusal does not have any effect on them. Therefore, the researcher is required to show how participants were approached and whether incentives were used to recruit participants. Importantly, the researcher should be cautious not offer excessive incentives because they can be considered as a type of coercion (Polit and Beck, 2014). Another important issue with recruitment is fairness. The researcher should be completely fair with the participants with regards to the advantages, risks and burdens of the research. There should also be no discrimination based on ethnicity, sex, or any other factor. If there is any inclusion or exclusion of any participant or group of participants, it should be scientifically justified (Connelly, 2014).

In this study, the researcher applied to the ethical approval board at Northumbria University to accept his research. His application was reviewed and accepted by the ethical approval board. The researcher was very cautious to keep the confidentiality of all the personal information related to the participants, and he put their safety as the first priority in the data collection process. Prior to data collection, the researcher explained in Arabic to the participants about the research objectives, and what is required from them as participants. All instructions were clearly written in Arabic at the beginning of the questionnaire. Consent was verbally acquired from the participants, who were very interested in the topic of this research. No incentives were offered to participants who voluntarily accepted to participate in the study.

5.5 Research Design

The most important decision in conducting a research is the appropriate design of the research. Trauth (2001) discusses five important factors that affect the choice of appropriate qualitative research methods: (a) research problem, (b) degree of uncertainty in the phenomenon, (c) the theoretical lens of the researcher, (d) the skills of the researcher, and (e) the academic politics. As is discussed by Trauth (2001), the choice of the appropriate research methodology is influenced by the research problem itself. The main objective of this research is to study the concept of disasters in Islam and how Islam can help in disaster risk reduction, using Saudi Arabia as a case-study. According to the literature reported in Chapter Three, there has been too much uncertainty surrounding this topic because it is under-researched in the literature.

This section presents the design of this study in terms of setting and population, data collection and data analysis.

5.5.1 Background Information and Population

The study was supposed to be conducted in five regions in the kingdom, namely Riyadh, Makkah, the Eastern Area (Alsharqia), the Northern Area (Al Hudud ash Shamaliyah) and Jizan Area (see Figure 5.1). However, because of the conflict in Yemen, it was not possible to the researcher to collect data from Jizan. Therefore, data was collected from four regions of the Kingdom of Saudi Arabia, because it is very difficult to cover all the parts of the kingdom which is very big. The study covered in particular Riyadh, Makkah, the Eastern Area

(Alsharqia) and the Northern Area (Al Hudud ash Shamaliyah). These four regions were selected because they, as is shown in Figure 5.1, are a sample that covers the majority of regions in the kingdom, from the south to the north, from the east to the west and the middle of the kingdom. To put it in numbers, the size of these four regions (1.323,678 Km²) represents more than 50 percent of the overall size of the kingdom (2.149,690 Km²) (The Central Department of Statistics and Information, Kingdom of Saudi Arabia, 2014). In addition, the population in these four regions (20,090,400) is over two thirds of total population of the kingdom (29,994,300) in 2013 (The Central Department of Statistics and Information, Kingdom of Saudi Arabia, 2014). Also, two regions of the sample, Makkah and the Eastern Area, overlook two seas, namely the Red Sea and Arabian Gulf respectively.

Figure 5.1: Administrative Regions in the Kingdom of Saudi Arabia (Memish et al., 2014)



5.5.2 Sampling

A sample is defined by Oxford Learner's Dictionaries as "a number of people or things taken from a larger group and used in tests to provide information about the group." Sampling is very important in the design of qualitative research (Mason, 2002). Similarly, Noy (2008) says that sampling in qualitative research has been overlooked as the least attractive methodological procedures. Noy (2008) explains that this underestimation of sampling in qualitative research can be attributed to the claim that qualitative researchers employ methods that are usually used in quantitative research. In this claim, sampling is seen as a too much technical procedure that is often used in scientific analysis, namely quantitative analysis, so qualitative researchers do not require reconceptualization in their analysis.

In the current study, the aim in sample selection was to achieve geographic and demographic homogeneity. As for geographic homogeneity, the sample was chosen from the same country, which is the Kingdom of Saudi Arabia. In particular, the sample was chosen from four provinces, which are the largest in the kingdom and they have the highest density of population in the Kingdom, as is shown in Section (4.2.1). Therefore, these four provinces roughly reflect the whole population in the kingdom. As for demographic homogeneity, all the participants were chosen from one ethnicity, namely Arabs. In particular, all of the participants were Saudi Arab Muslims. Demographic homogeneity was also achieved in the focus-group participants. All of them were scholars in Islamic Studies at the Islamic University in Al Madinah Al Munawarah.

It is not easy to penetrate into the life of participants, explore the secrets of their life, and know about their beliefs, which is usually sought in qualitative research (Noy, 2008). In such a situation, snowball sampling is a practical procedure because it depends on the dynamics of natural and organic social networks. In an attempt to explain what is meant by snowball sampling, Noy (2008: 330) says:

A sampling procedure may be defined as snowball sampling when the researcher accesses informants through contact information that is provided by other informants. This process is, by necessity, repetitive: informants refer the researcher to other informants, who are contacted by the researcher and then refer her or him to yet other informants, and so on. Hence the evolving 'snowball' effect, captured in a metaphor that touches on the central quality of this sampling procedure: its accumulative (diachronic and dynamic) dimension.

Snowball sampling has been found to be economical, efficient and effective (Singh et al. 2007).

Snowball sampling is a non-probability sampling technique (Bird and Dominey-Howes, 2008), which allows researchers to penetrate an anonymous community and identify and recruit key informants (Bird, 2009). This is useful in situations where it is difficult or expensive to locate respondents in the study population (Singh et al.2007). For example, snowball sampling is very effective when obtaining information about drug-dealers or the elite in society.

In the current study, obtaining information by the researcher, who is male, from female participants was not possible because, according to the customs and traditions in Saudi Arabia, recruiting female respondents is quite difficult (Zabin, 2010). Therefore, the snowball sampling technique was used to obtain information from both male and female participants. According to Handcock and Gile (2011) snowball sampling is particularly applicable to hard to reach groups. Female interviewees are a hard to reach group in the Kingdom of Saudi Arabia. The researcher recruited female relatives to undertake the questionnaire. In order to maintain consistency the researcher opted to use snowball sampling to identify male candidates.

The snowball sampling was felt to be a good method to collect questionnaire data because it saves time and efforts. The researcher recruited female assistants who are related to the researcher, and these assistants recruited other female participants. Questionnaire data was collected by recognising participants through direct contacts, who are then asked to recruit others (Sadavoy et al. 2004). Table 5.2 shows background information on the participants who responded to the questionnaire:

Table 5.2: Background information on participants who responded to the questionnaire

Question	Choices	Number of respondents
Gender	Male	100
	Female	100
Age group	16-20	10
	21-30	43
	31-40	88
	41-50	47
	51-60	13
	60+	1
Marital status	Married	161
	Single	39
Type of house	Flat	67
	House	49
	Villa	84
Region	Riyadh	50
	Makkah	50
	Eastern Area	50
	Northern Area	50
Level of Education	Primary school	3
	Intermediate school	3
	High school	41
	Bachelor Degree	127
	Master	20
	Doctorate	6
Job	Governmental employee	168
	Private employee	
	Businessperson	1
	Student	24
	Retired	2
	Unemployed	5

As is shown in Table 5.2, 100 male and 100 female participants responded to the questionnaire in the study. They were equally distributed over the four regions, 25 male and 25 female participants from every region. All the participants were over 16 years old, with the majority in the age rang 21- 50. Importantly, the majority of participants had or were studying a university degree, which means that they were educated. Also, over three thirds of the participants were employed by the government.

In addition to the participants of the questionnaire data, a focus group interview was conducted with six male lecturers at the Islamic University in Al Madinah Al Munawarah in the Kingdom of Saudi Arabia. Five of them held a PhD. degree in Islamic Studies and one was pursuing his PhD. in Islamic Studies. They ranged in age between 30 and 70. One of them was the dean of

the Faculty of Hadith and Islamic Studies at the Islamic University in Al Madinah Al Munawarah, while another one was the head of Hadith Department. The researcher could not conduct interviews with female Islamic scholars because, as mentioned above, the traditions in the kingdom of Saudi Arabia prohibit mixing between men and women. Therefore, the focus-group interview was restricted to male participants only.

An interview was also conducted with the General Administrator for Disaster Reduction and Recovery Risk in the Presidency of Meteorology and Environment and a participant who was working in the General Directorate of Civil Defence that is responsible for dealing with natural disasters.

5.5.3 Data Collection Methods

A mixed approach, including primary and secondary data, would be the most useful for this research. Secondary data is obtained from previous work by other researchers, readily available for a researcher to use (Flowerdew *et al.*, 2005:57). The researcher obtained useful secondary data from literature, reports, government publications and newspapers. It is very important to be aware of current policies, laws and regulations adopted by relevant environmental organizations in the country. In addition, the researcher collected data about the history of disasters in KSA since 1945.

Primary data was collected using mixed methods, namely a questionnaire, an interview, and a focus group. The three methods used in the study targeted three different kinds of participants to collect different information. In other words, the questionnaire aimed at collecting information about the perception and preparation of Saudi people to face natural disasters, while the focus group aimed at understanding the perception and role of Islamic teachings in DRR. The questions used in the focus group are generally different from the ones used in the questionnaire because the two kinds of participants are totally different. That is, participants in the questionnaire say what think or believe in, while participants in the focus group say what Islamic religion says according to the teachings of Islam. As for the questions used in the interviews, it aimed at exploring the efforts of the Saudi government in DRR.

5.5.3.1 Questionnaire

A questionnaire is a list of questions that the researcher prepares beforehand and respondents are expected to either reply in their own words or choose an answer(s) from a list of multiple choices (Rugg and Petre, 2007). The questions chosen in a questionnaire should be carefully designed to address the main issues of research questions. Taylor-Powell (1998) points out that a questionnaire is usually used to collect different kinds of information:

- Knowledge: what people know; how well they understand something
- Beliefs, attitudes and opinions
- Behavior: what people do
- Attributes: what people are; what people have

A questionnaire is used when data is collected from a large number of participants to save efforts and time. It is also used when participants are interested in keeping their privacy and do not want to reveal their names, work, gender or identity.

There are two types of questions in questionnaires: open-ended questions and close-ended questions. The respondents, in open-ended questions, are allowed to provide their own thoughts and ideas, so it requires more effort from participants to provide their answers. Respondents in close-ended questions, on the other hand, have to choose from a list of options where they are usually asked to choose either one option or a multiple of options (Taylor-Powell, 1998).

There are many advantages and disadvantages for using questionnaires. Questionnaires are a good way to collect data from a large number of participants, especially when people live across wide geographical areas. Second, the use of questionnaires saves time and cost on the part of the researcher because researchers do not have to go and meet participants in person. Third, participants find questionnaires flexible because they can answer them at their pace. However, responses to questionnaires can be at a low rate because many participants do not reply to the researcher. Also, there is sometimes no control over how complete the questionnaire so there can be response bias. Moreover, some people cannot read the questionnaire. For example, people with reading impairment or cannot read in their own language or another language cannot answer the questionnaire.

As discussed earlier, this study assesses disaster risk reduction in the Kingdom of Saudi Arabia with the main focus on the role of Islamic teaching in the perception and reduction of the risks of natural disasters. In particular, this study aims to investigate what Saudi people know about natural disasters and what role Islam plays in the perception and reduction of natural disasters. Data was collected from a number of geographical areas in the country, which made it very difficult for the researcher to meet participants in person. Furthermore, the special cultural and traditional values of the Saudi people do not allow the researcher to meet in person participants from a different gender in person, namely women. Therefore, a questionnaire was felt to be convenient as a data collection method in this study.

All the questions and choices used in the questionnaire were written in English and translated into Arabic (For full details see the questionnaire in Appendix A). The translations were reviewed by a bilingual person who was holding a Ph.D. degree in Linguistics. The questionnaire consisted of 20 questions, which were divided into three main parts: background information about participants, perception of natural disasters by Saudi people and preparedness to face natural disasters in the Kingdom of Saudi Arabia.

Part one addressed general background information about participants in terms of gender, age, education level, region, employment status, marital status and accommodation type in the Kingdom of Saudi Arabia. This type of information is very important to see if background factors, say gender or region, have an effect on the results.

Part two addressed participants' knowledge and perception of natural disasters. This part is important to see whether participants perceive what a disaster is, what might cause a disaster, whether they are worried about natural disasters, and how they access information about disasters. Importantly, this part tries to know about participants' beliefs on the causes of natural disasters and their interpretation in Islam.

Part three addressed participants' views on preparation for natural disasters. It investigates participants' previous preparedness for natural disasters and their willingness to take part in any training to prepare for natural disasters. It also investigates whether participants think they

can help to reduce the risks of natural disasters in Saudi Arabia and what role a mosque has in the reduction of natural disasters effects.

The majority of questions in the questionnaire were multiple choice questions except of questions 14, 15, 19 and 20, which were on Likert scale from 1 to 5 (1 is the least important and 5 is the most important).

5.5.3.2 Interviews

An interview or “a conversation with a purpose” is one of the common data collection methods in qualitative research (Rugg and Petre, 2007: 135). Interviews are appropriate for the study of experiences, such as emotions, needs, opinions and desires. Interviews can be structured, semi-structured or unstructured. In a structured interview, the researcher asks all the participants the same questions. In the case of semi-structured interviews, the researcher asks a list of open-ended questions about the topic of interest. Hancock (2002: 9) comments that “the open ended nature of the question defines the topic under investigation but provides opportunities for both interviewer and interviewee to discuss some topics in more detail.” DiCicco-Bloom and Crabtree (2006) point out that semi-structured interviews are very common in qualitative research and can be conducted with groups or individuals. While semi-structured interviews with individuals allow the researcher to go deep into the life of the interviewee and explore a wider range of experience, semi-structured interviews with groups “take the form of focus groups, with multiple participants sharing their knowledge or experience about a specific subject. Each focus group represents a single entity within a sample of groups – it is not an interview with distinct individuals and is not a short cut for collecting data from several individuals at the same time” (DiCicco-Bloom and Crabtree, 2006: 315). Whether semi-structured interviews are conducted with individuals or groups, they are generally conducted once with interviewees and last between 30 minutes and many hours.

Different from structured and semi-structured interviews, the research in the unstructured interviews meets the participant with the aim of discussing the topic with very few ideas and questions. When the researcher assesses the participant’s previous knowledge, direct questions related to the topic can be asked.

DiCicco-Bloom and Crabtree (2006) argue that only unstructured and semi-structured interviews are used in qualitative research, while structured interviews are common in quantitative research. This can be attributed to the idea that the researcher in quantitative research approaches participants with a prior hypothesis in mind to test its validity, so very structured interviews with standardised questions and analysis is highly expected in quantitative research. In qualitative research, in contrast, the researcher approaches participants to explore the ideas and world to form a better understanding of a certain phenomenon or generate a new hypothesis. DiCicco-Bloom and Crabtree (2006: 314) say that “The purpose of the qualitative research interview is to contribute to a body of knowledge that is conceptual and theoretical and is based on the meanings that life experiences hold for the interviewees.”

Interviews give the researcher an opportunity to go deep into the world of the interviewee and discuss his/her ideas and thoughts. In this regard, Rugg and Petre (2007: 137) say that interviews are a useful data collection method “because there are no restrictions on the type and the format of questions, you can poke around in a versatile manner, doing the verbal equivalent of peering into thickets and turning over rocks. This can give you some useful insights into what’s out there, and also into what appears not to be out there.”

As a questionnaire is not enough to get better understanding of disasters in the Kingdom of Saudi Arabia, the researcher held two interviews with two participants. The interviews included decision makers and officials from ministries and organizations involved in disaster management and environmental protection. Although the researcher tried hard to contact many officials in governmental organizations in the Kingdom of Saudi Arabia, he received few replies because they were busy with the conflict in Yemen to the southern borders of Saudi Arabia. However, the researcher managed to hold two interviews with the General Administrator for Disaster Reduction and Recovery Risk in the Presidency of Meteorology and Environment and a participant who was working in the General Directorate of Civil Defence that is responsible for dealing with natural disasters.

The purpose of the interviews was to become more familiar with the current rules and regulations, the ways they are implemented and related issues. In addition, the researcher planned to conduct further interviews with decision-makers in order to obtain an idea about

their views on disaster management. However, the escalation of war in Yemen limited the number of interviews to just two.

5.5.3.2 Focus Group

A focus group is a collection of individuals who meet for a specific purpose, which is to gather and discuss information. These groups usually have their own procedures, composition and size. The first origin of focus groups goes back to sociology, but now this data collection method is commonly used in other fields (Freitas et al., 1998). Lederman (1990: 17) explains some characteristics of a focus group:

- The technique involves the use of in-depth, group interviews in which participants are selected because they are a purposive, although not necessarily representative, sampling of a specific population.
- ...homogeneity is an important prerequisite for meaningful exploration of the topic upon which the group is 'focused'.
- ...the emphasis in the use of group interviews on their ability to generate data about the 'why' behind the behaviour; the ability to ask the kinds of questions that surveys don't ask and that individual interviews, too, miss.

Similarly, Krueger (1994) focuses on the homogeneity of the group to make participant fully engaged in the discussion of the topic. Such homogeneity should be in gender, social and ethnic background. Some researchers say that it would be better if the members of the group do not know each other so that there would be an honest discussion of the topic and prevention of the behavioural effects of pre-existing relations (Krueger, 1994). However, Kitzinger (1994) advocates the use of groups whose members already know each other because it usually triggers the spirit of challenge between them.

Researchers normally use this method to gain a better understanding about a certain issue, product or service. Members of the group share interest in the subject which the group focuses on (Krueger and Casey, 2000). A focus group is used for a variety of purposes, as is outlined by Freitas et al. (1998: 2):

This FG [Focus group] research method is advisable for generating ideas for investigation or action in new fields; for generating hypotheses based on the perception of the participants; to evaluate different research situations or study populations; to develop drafts of interviews and questionnaires; to supply interpretations of the participants' results from initial studies; and for generating additional information for a study on a wide scale.

Focus groups utilize communication between research participants in order to create data (Kitzinger, 1995). Such a technique is used because the people who are selected have something to say about the topic and have a similar socio-features which makes it easier for them to talk and discuss with each other (Rabiee, 2004).

In addition to the participants, a focus group interview should be run by a skilful moderator who has a very important role to play. Plummer-D'Amato (2008:71) defines the moderator as “a non-participant whose role is to facilitate the group processes and ensure the discussion covers the topics of interest.” A successful moderator should possess the following skills and abilities (Hurworth, 1996):

- 1- Capability of creating a purposeful introduction which help to shape ground roles for discussion;
- 2- Capability of encouraging participants to share their ideas and views;
- 3- Capability of maintaining the focus group discussion and avoiding constraining or directing it;
- 4- Capability of encouraging shy participants to talk and controlling talkative ones;
- 5- Capability of being non-judgmental and establishing rapport;
- 6- Capabilities probing and pausing effectively; and
- 7- Capability of being empathetic and positive towards people's emotions and feelings.

In addition to these skills and abilities, the moderator should have good knowledge about the topic of discussion, objectives of the study and question route (Plummer-D'Amato, 2008). The role of the moderator is very important to create a friendly and comfortable environment for discussion of the topic, especially when the participants do not know each other (Rabiee, 2004). However, a moderator should pay attention to some important issues that might have a negative

influence on the focus group discussion. For example, a moderator who has good knowledge about the topic, especially academic professionals, should be care not impose his/her point of view on the participants because the moderator needs to be a good listener who gives time to participants to express their ideas and views (Stewart and Shamdasani, 1990). In this regard, Krueger and Casey (2000) point out that skilful professional moderators are the ones who can be emotionally detached from the topic to give himself/herself more time for listening to others point of views. Hence, the distance of moderator from the topic enhances the objectivity of the focus group interview.

The selection of the participants of the focus group should not be random sampling for a number of reasons (Roberts, 1997). First, the selected random sample may not be interested in the topic of investigation which affects the findings of the discussion. Second, random sampling of the focus group may lead to inconvenient participants and, most likely, to unrepresentative responses. Therefore, random sampling of the focus group is not preferred. Instead, the selection of the participants in the focus group should depend on the nature of the research questions. Different kinds of questions need different kinds of participants who are familiar with the topic. However, selective sampling can be criticised for selection bias and unintentional data contamination (Paula et al, 2001). Paula et al (2001:48) points out that “purposive sampling deliberately aims to ascertain theoretical insights into the cultural variables of the population and tends to generate rich data, which broadly reflects the population from which it is drawn.”

A note taker should also be present in the focus group interview “to observe non-verbal interactions, indicate the impact of the group dynamic, document exchanges of views and the general content of discussion and note which statement is made by which particular individual, thereby supplementing the oral text and enabling a fuller analysis of the data” (Rabiee, 2004: 656).

Focus groups are particularly useful for assessing the impressions and perceptions of people about issues, products or services. Information gathered by focus groups is often used in several fields such as decision making, planning and goal setting, needs assessment, quality improvement and policy making and testing.

In this study, focus group discussion was used to assess the socio-cultural factors such as faith and personal responsibility that can affect the perception and reduction of disaster risk. Special attention was paid to the effect of Islamic culture and Islamic teachings on people's reaction towards disasters and perception of natural disasters. The researcher tried his best to maintain the homogeneity of the focus group so only Arab male scholars in the Islamic religion at the Department of Islamic Studies at the Islamic University in Al Madinah Al Munawarah in the Kingdom of Saudi Arabia were recruited in the focus group. Therefore, homogeneity was achieved in the choice of the focus group in terms of gender, ethnicity and social status. Since the participants of the focus group were scholar in the Islamic religion, they were supposed to have good knowledge about the Islamic perception of natural disasters and the role of Islam and Islamic teachings in disaster risk reduction. The participants were colleges at the same department so they already knew each other. Therefore, a relaxed and comfortable discussion of the topic prevailed in the interview where the researcher himself was the moderator of the discussion. The researcher was also the note taker during the discussion.

Issues, which were raised in the discussion, included the views of Islam on the role of the individual in society before, during and after disasters. The discussion also focused on the views of Islam on preparedness for natural disasters and the Quranic and Prophetic traditions that relate to natural disasters.

The researcher was the moderator and the note-taker in the discussion of the focus group.

These three methods used in this thesis address the main research questions mentioned in Section 1.5, as is shown in Table 5.3.

Table 5.3: Methods used to address main research questions

Research Question	Method
Saudis' perception and preparation to face natural disasters	Questionnaire
Saudi government response to face natural disasters	Interview and previous literature
Islamic concept of natural disasters	Focus-group interview
Role of Islamic culture in DRR	Focus-group interview, questionnaire, Islamic literature

As is shown in Table 5.3 the questionnaire was used to investigate how Saudi people understand and prepare to face natural disasters in the Kingdom of Saudi Arabia. The two interviews and the previous publications about the KSA were used to collect information about the efforts of the Saudi government and the response to mitigate the risks of natural disasters in the kingdom. As for the focus group and the Islamic literature, especially the Holy Quran and the Hadith of Prophet Mohammad (Peace be upon him), they were used to explore the Islamic concept of natural disasters and understand the role of Islamic teachings in disaster risk reduction.

5.5.4 Reliability of the Testing Methods

The effectiveness of the questionnaire was evaluated by the use of a Pilot Study on a group of students in the North East of England⁷. The questionnaire used in the pilot study consisted of 20 questions which were divided into three main parts. All the questions and choices were written in English and translated into Arabic (For full details see the questionnaire in Appendix A).

5.5.4.1 Observation, Participants' Comments and Suggestions in the Pilot Study

The researcher observed that the participants were very interested in participating in the study because they thought this project is important due to the recent natural disasters in the Kingdom of Saudi Arabia, especially floods.

During the process of answering the questions, participants chose more than one option although they were not asked to do so in the questionnaire. For example, in answering question eleven, many participants chose more than one option and some of them asked the researcher whether they can choose more than one here because they felt that more than one option is possible. Therefore, the researcher modified this question and made more than option possible in the final version (see the questionnaire in Appendix A). The same thing happened with question twelve, where they asked if the researcher can add one option which is 'all mentioned above.' Therefore, the researcher added this option to the final version of the questionnaire. In question thirteen, participants asked whether the researcher can put the options on a scale of

⁷ For full details of the pilot study participants and results, see Appendix B

importance because all of them are important impacts of natural disasters, but some of them are more important than others. Therefore, the researcher changed the question and choices into a scale of importance.

Although all the participants in the pilot study were studying for a degree in the United Kingdom, the researcher noticed that the majority of them were reading the Arabic translation of the questions and options, not the English one. They also preferred to use Arabic in their discussion about the questionnaire with the researcher.

The researcher felt that the piloted version of the questionnaire was a reliable instrument to collect data from participants in the Kingdom of Saudi Arabia. Therefore, modifications to the questionnaire used in the pilot study were applied and a final version for the main study was adopted, as is shown in Appendix A.

5.5.5 Procedure of Data Collection

As mentioned above, this study used three means for data collection, namely a questionnaire, a focus group interview and interviews with Saudi officials who are involved in disaster risk reduction.

The questionnaire was, as mentioned above, designed and piloted to check its reliability, and amendments were carried out in the light of pilot-study participants' recommendations and suggestions. The researcher had to get approval first from his work and other different official bodies in the kingdom for data collection because he is working in the military field. He filled in the required documents and applied for data collection in the Kingdom of Saudi Arabia, in particular in Riyadh Province, Makkah Province, the Eastern Province (Alsharqia), the Northern Province (Al Hudud ash Shamaliyah) and Jizan Province. Two months later, the Ministry of Interior in the Kingdom of Saudi Arabia accepted the request for data collection by the researcher in Riyadh Province, Makkah Province, the Eastern Province (Alsharqia) and the Northern Province (Al Hudud ash Shamaliyah). However, the researcher could not get permission to collect data from Jizan Province because of the conflict in Yemen at the same period data collection was planned. Therefore, data collection was restricted to four provinces instead of five. Once the approval was accepted, the researcher applied to his school at

Northumbria University for a leave for data collection from the Kingdom of Saudi Arabia. Once the researcher got the school approval, he travelled to Saudi Arabia and started the process of data collection. Some copies of the questionnaire were printed out and sent to participants as a hard copy, while others received it as a soft copy by email.

The researcher started the process of data collection from Riyadh Province because his workplace and permanent residence is in Riyadh. Therefore, the researcher had a good network of relationships in Riyadh, which made it easier for the researcher to take Riyadh Province as the starting point for data collection. After Riyadh, the researcher travelled to Makkah Province and distributed the questionnaire to his acquaintances who recruited other participants who they know in person. As for the Northern Province and Eastern Province, the researcher sent copies of the questionnaire by post to his acquaintances who in turn recruited other participants who they know in person. Importantly, the researcher held training sessions in advance with all of his acquaintances who recruited other participants in the four provinces.

As the researcher could not contact female participants directly, he asked for help from his sisters to coordinate between him and the female participants. The researcher conducted a two-hour training session for the female assistants, explaining the process of data collection and what they were required to do. After completing the training sessions, the female participants contacted their acquaintances in the four regions, and then these acquaintances contacted other participants who they know in person.

The total number of sent questionnaires was 352 to 352 participants (150 female and 202 male participants) in four regions. Out of the 352 sent questionnaires, only 200 questionnaires were answered and returned back to the researcher. However, 30 applications were not fully completed by some participants, thus they were excluded from the study. In this case, the number of complete questionnaires received by the researcher was 170 distributed to the four regions as is shown in Table 5.4.

Table 5.4: Number of participants who completely answered the questionnaire by province

Province	Male participants	Female participants
Riyadh	23	21
Makkah	22	23
Eastern Province (Alsharqia)	19	20
Northern Province (Al Hudud ash Shamaliyah)	23	19
Total	87	83

The planned number of participants was 200, which was supposed to include 50 participants (25 male and 25 female participants) from every province. Therefore, the researcher sent again questionnaires to new male and female participants in the four areas to reach the planned target. The number of sent questionnaires to every province varied according to the number of the completed questionnaires that the researcher had already received. After the exclusion of incomplete questionnaires, which were received for the second time, the researcher reached the planned target, which was 25 male and 25 female participants from every province. Therefore, the total number of questionnaires analysed in this study was 200.

While the researcher was waiting for a reply for the questionnaires, he contacted some people who were responsible for disaster risk reduction in the kingdom. The researcher explained to them that he is interested in conducting an individual interview with them to discuss the efforts of the kingdom in disaster risk reduction. Unfortunately, many of them said they were too much busy and could not conduct any interview. However, two of them were interested and said that they are ready for the interview. The first interview was in Riyadh with a colonel who was working in the General Directorate of Civil Defence that is responsible for dealing with natural disasters in the Kingdom of Saudi Arabia. The interview was held in his office the General Directorate of Civil Defence. The researcher asked him about the role of Saudi Civil Defence in minimizing the effects or forecasting environmental disasters, especially weather-related disasters. The interview lasted for 70 minutes and was recorded on the researcher's mobile phone (iPhone 6). All the questions and discussion was in Arabic, then transcribed by the researcher and sent to a sworn translator for translation.

Another interview was conducted with the head of the general administration for disaster reduction and recovery risk in the Presidency of Meteorology and Environment in the Kingdom of Saudi Arabia. The headquarters of the Presidency of Meteorology and Environment is in Jeddah, so the researcher travelled there and met the participant at his office. After explaining the objectives and the importance of the research, the participant said he is very interested in the research and verbally agreed to participate. The researcher focused his questions on the tasks of the administration and its national and regional activities. All the questions and discussions were in Arabic, and the interview, which lasted for 90 minutes, was recorded on the researcher's mobile phone (iPhone 6). Then, the researcher transcribed the recording and sent it for translation by a sworn translator.

The focus group interview was conducted in Al Madinah in the Kingdom of Saudi Arabia. The researcher travelled from Riyadh to Al Madinah Al Munawarah and met the participants at the office of the dean of the Faculty of Hadith and Islamic Studies at the Islamic University in Al Madinah Al Munawarah. To ensure that interruption and noise are reduced to the minimum, the researcher and the participants in the focus group moved to a quiet hall to hold the discussion. The researcher explained to them that the topic of his research is vulnerabilities, which may lead to weather-related disasters in the Kingdom of Saudi Arabia. Disasters, of course, mean general natural disasters such as floods, torrents, dust storms, cold storms, heat waves, earthquakes and volcanoes. The researcher explained to them that this research is important because there has been an increase in natural disasters in the kingdom and an increase in the economic and human cost to face such disasters. There is also lack of data and studies about such disasters in the kingdom. The researcher explained to them the main objective of the research is to study the role of Islamic teachings in the perception and reduction of the risks of natural disasters. Once the participants verbally consented to take part in the study, the researcher told them that he would like to know what Islam said about natural disasters; does Islam encourage people to prepare for natural disasters? Or just when a disaster happens, because we deal with disasters by preparing for them before they happen. For example, we issue regulations which prohibit constructing buildings in flood plain, or just when a disaster happens we respond to it.

The interview with the focus group lasted for 90 minutes, and it was recorded on the researcher's mobile phone (iPhone 6). All the discussion and questions in the focus group

interview were in Arabic. As mentioned above, the researcher himself was the moderator and the note-taker in the focus group discussion. Once the meeting finished, the researcher thanked them for their precious time and support, and then he left to Riyadh. The focus group interview was transcribed in Arabic by the researcher, and then was sent for translation by a sworn translator. The translated copy of the focus group interview was used in data analysis.

The whole process of data collection lasted for 90 days. When all data collection had finished, the researcher returned back to the United Kingdom and the process of scoring and data analysis started.

5.5.6 Data Scoring and Analysis

There are many analytical tools used in qualitative research to make meaning. Data analysis in qualitative research was thought of as a mysterious transformation process because the researcher looks at the data, applies his or her analytical experience and powers to end with some findings (Merriam, 1998). Therefore, data analysis in qualitative research is an intuitive process. However, Krauss (2005) argues that the process of data analysis in qualitative research is a very difficult task because subjectivity is expected to prevail throughout the exchange of ideas and thoughts between the researcher and the participants, yet the researcher should try to avoid imposing his own views and previous knowledge and be open to the responses of participants.

Questionnaire data was scored by counting the number of responses by participants. Since there were 200 participants, there were 200 responses for the majority of questions. In some questions, such as questions 8, 11 and 12, it was possible for participants to choose more than one option. Therefore, it was possible to have more than 200 responses in these questions. Questions 14, 15, 19 and 20 were on Likert scale from 1 to 5, with 1 the least important and 5 the most important. Responses for every scale of importance were calculated.

Qualitative analysis was applied to the questionnaire questions. All the questions in the questionnaire were analysed according to the highest or lowest number of responses. All responses to the questionnaire were represented in figures and diagrams in the Results Chapter.

The main points in the two interviews and the focus-group interview were summarized as bullet points and reported in tables in the Results Chapter.

5.6 Summary

This chapter discussed methodological issues and the methodology adopted in the study for data collection. It has shown that qualitative approaches reflect issues related to human emotions, feelings, beliefs and values more than quantitative methods. Therefore, the researcher felt that a qualitative approach is better to investigate the role Islamic teachings in the reduction of natural disasters in the Kingdom of Saudi Arabia. Hence, a questionnaire, an interview and a focus-group interview were used as data collection tools in the study. The reliability of the questionnaire was tested via a pilot study which shed light on some issues in the questionnaire. These issues were addressed by the researcher in the light of the suggestions and comments of the participants in the pilot study.

The researcher, as shown above, followed a snowball sampling technique for the collection of questionnaire data. This technique was adopted because it saves time and efforts, and most importantly, it is very useful when there are cultural issues related to data collection from female participants, as is the case in the Kingdom of Saudi Arabia. Therefore, the researcher depended on female assistants for data collection from female participants, and these female assistants were trained to collect data from female participants. As for the male participants, the researcher, as shown above, relied on his acquaintances who recruited other participants in the two provinces out of the four provinces under study in the Kingdom of Saudi Arabia.

Chapter Six: Results

6.1 Introduction

This chapter presents the results of the empirical study. The discussion in the first three chapters of the role of faith, in general, and the role of Islamic teachings, in particular, in the reduction of the risks of natural disasters showed the Islamic perspective on disaster risk reduction. However, the role of Islamic teachings in disaster risk reduction, as was shown in the literature review, has been under-researched. The aim of the research, as mentioned in Section 1.4, is to evaluate current approaches to disaster risk reduction in the Kingdom of Saudi Arabia and examine the actual and potential role of Islamic teaching in the perception and reduction of the risks of natural disasters.

This chapter starts by presenting the results of the questionnaire to better understand the perception and preparedness of people in the Kingdom of Saudi Arabia to face the risks of potential and recurrent natural disasters in the kingdom. The results of questionnaire are presented as overall results first, then they were presented by gender and province. Such presentation of the questionnaire results is thought to be important by the researcher to see if there is any effect for gender or region on the overall results of the questionnaire results. Therefore, the questionnaire results were presented as overall results first, and then they were presented by gender and province.

The interviews were transcribed, translated into English and summarized as main points here to gain knowledge about the status and efforts of the Kingdom of Saudi Arabia in disaster risk reduction. As for the focus-group interviews, which is the focus of this study, transcribed, translated into English and presented here as main points to gain better knowledge of the role of Islam and Islamic teachings in disaster risk reduction.

6.2 Questionnaire Results

The questionnaire in this study was used as a data collection method to gain better understanding of the perception and preparedness of people in the Kingdom of Saudi Arabia

to face the risks of natural disasters, especially weather-related disasters, in the Kingdom of Saudi Arabia.

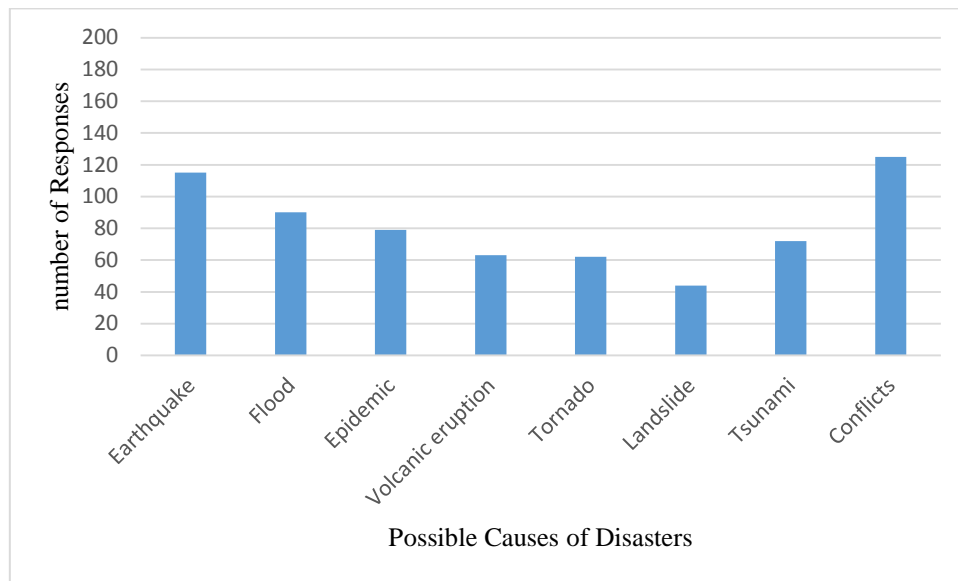
Questionnaire data, as mentioned in Section (5.5.6), was scored by counting the number of responses by participants. Since there were 200 participants, there were 200 responses for the majority of questions. In some questions, such as questions 8, 11 and 12, it was possible for participants to choose more than one option. Therefore, it was possible to have more than 200 responses in these questions. Questions 14, 15, 19 and 20 were on Likert scale from 1 to 5, with 1 the least important and 5 the most important. Responses for every scale of importance were calculated.

Qualitative analysis was applied to the questionnaire questions. All the questions in the questionnaire were analysed according to the highest or lowest number of responses. Questionnaire results, as mentioned above, were analysed according to overall results, results by gender and results by province.

6.2.1 Overall Results

Participants were asked in the questionnaire about what they generally think can cause a disaster in KSA. This question addressed the understanding about the possible causes of disasters and the probability of these causes. Figure 6.1 shows participants' opinions on what can cause a disaster in their province.

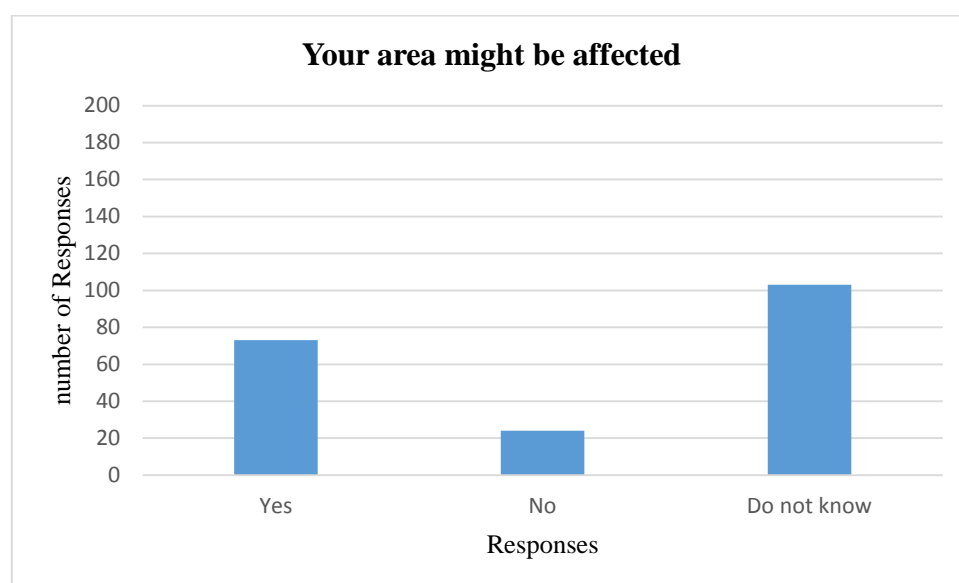
Figure 6.1: Participants' responses on possible causes of disasters



As can be seen from the figure, more than half of the participants considered Conflicts and Earthquakes as the highest possible causes of natural disasters, followed by Flood, Epidemic and Tsunami, while Landslide was not seen as a major cause of natural disasters in their areas. Actually, the choice of conflicts and earthquakes was expected because the eastern parts of the kingdom, especially along the Red Sea, are prone to earthquakes. As for conflicts, the Middle East has been witnessing an increasing wave of civil unrest since 2011. The high choice of Floods was also expected because many floods has occurred in the Kingdom of Saudi Arabia over the last decade.

Participants were asked if their areas might be affected by natural disasters. Figure 6.2 presents participants responses on whether their areas might be affected by weather-related disasters.

Figure 6.2: Do you think the area where you live might be affected by weather-related disasters?



As is shown in the figure, just over half of the participants did not know whether their areas might be affected by weather-related disasters, and nearly one eighth of them did not think that their areas might be affected by weather-related disasters. This indicates that the majority of participants lack knowledge and information about weather-related disasters in their provinces. However, over than one third of the participants thought their areas might be affected by weather-related disasters.

In addition to the probability of the occurrence of weather-related disasters, participants were asked if they were worried about the break out of weather-related disasters in their areas. Figure (6.3) illustrates participants' responses on whether they were worried.

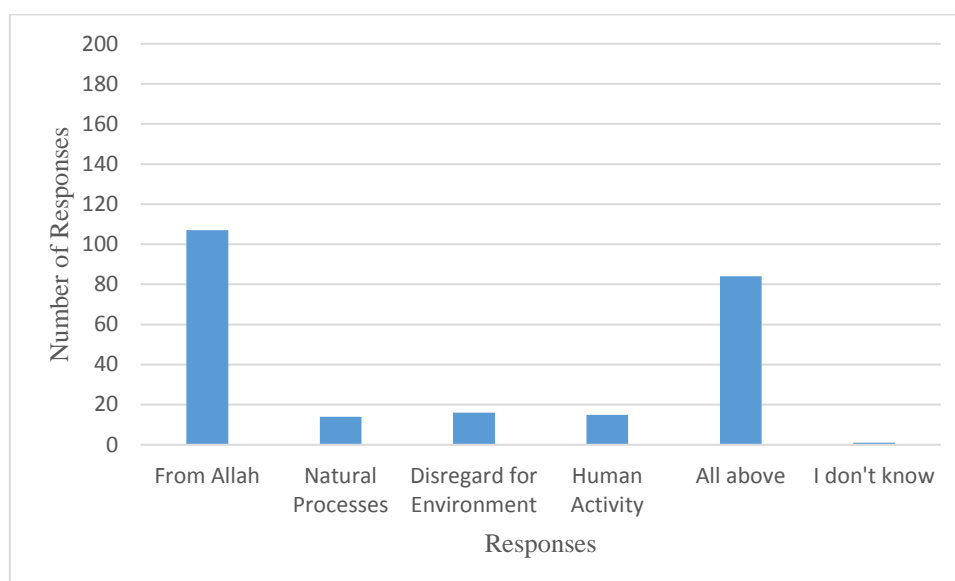
Figure 6.3: How worried are you about weather-related disasters in your area?



As can be seen from the figure, just over one third of the participants were either Fairly Worried or Not Very Worried. Less than one quarter of the participants were Not Worried at All about the occurrence of weather-related disasters in their areas. However, a small number of participants were either Very Worried or Do Not Know. Such results indicate that the majority of participants were not very worried about the occurrence of weather-related disasters in their provinces. This could be due to lack of knowledge about weather-related disasters in their provinces and the possibility of their occurrence, as is shown above.

To gain better understanding of participants' knowledge about natural disasters, they were also asked about their belief of the possible causes behind natural disasters, as is shown in Figure (6.4) below:

Figure 6.4: According to your belief⁸, what causes natural disasters?

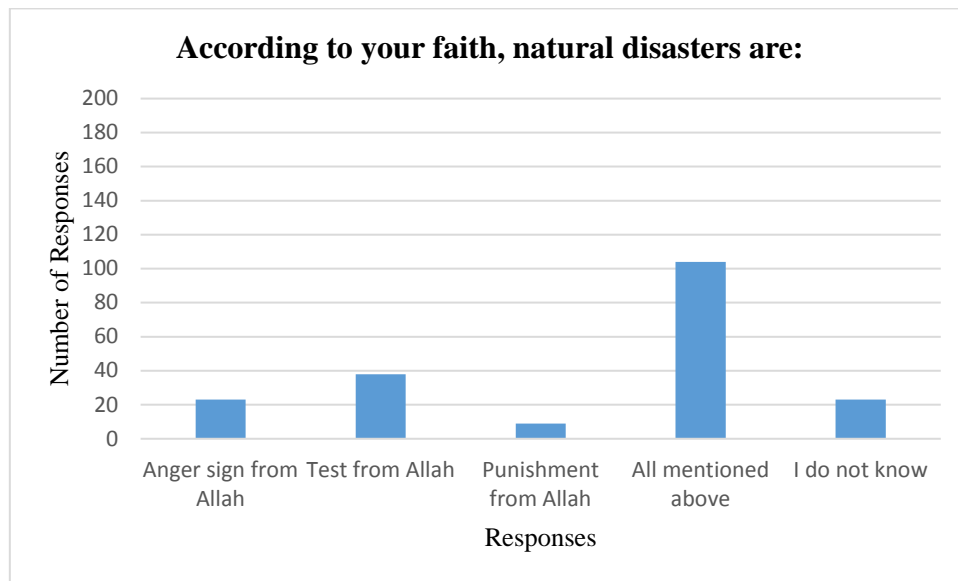


As is shown in Figure 6.4, nearly half of the responses were that “They are from Allah”, while few responses ascribed natural disasters to natural processes, disregard of natural environment or both of them. Such findings indicate that the majority of participants held a fatalistic view of natural disasters. That is, natural disasters are from God and man can do nothing to stop their occurrence or reduce their effects. However, just over a third said that all of the options are possible, which means that natural disasters can be caused by natural processes or disregard of natural environment as well.

If participants held a fatalistic view of natural disasters, we need more details about why natural disasters occur according their religious interpretation. Participants were asked about their religious interpretation of natural disasters. Figure 6.5 shows participants’ religious interpretation of natural disasters.

⁸ Belief here refers to what the participant thinks according to their convictions, not necessarily religion.

Figure 6.5: According to your faith⁹, natural disasters are:

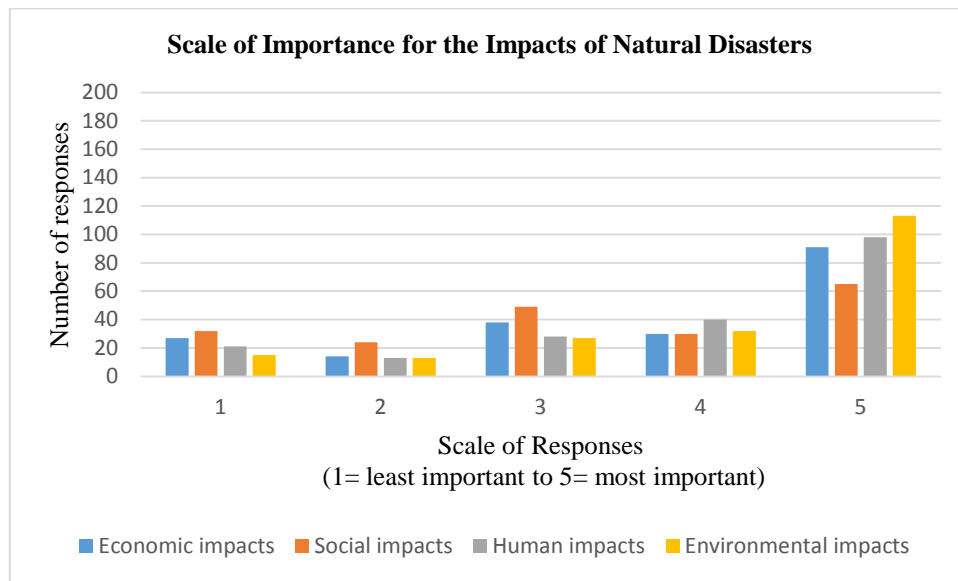


As is shown in the figure, over than half of the participants chose All Mentioned Above, which means that natural disasters can be an Anger Sign from Allah, a Test from Allah or a Punishment from Allah. However, when we look at these choices as individuals, not a whole, we find that less than 10 participants said that natural disasters are Punishment from Allah, while about 40 participants said it can be a Test from Allah. Such findings are not a strong support to a fatalistic view, which consider natural disasters mainly a punishment from God.

As for the impacts of natural disasters, participants were asked about the importance of different impacts of natural disasters, as is shown Figure 6.6.

⁹ Faith refers to the religious belief of the participant.

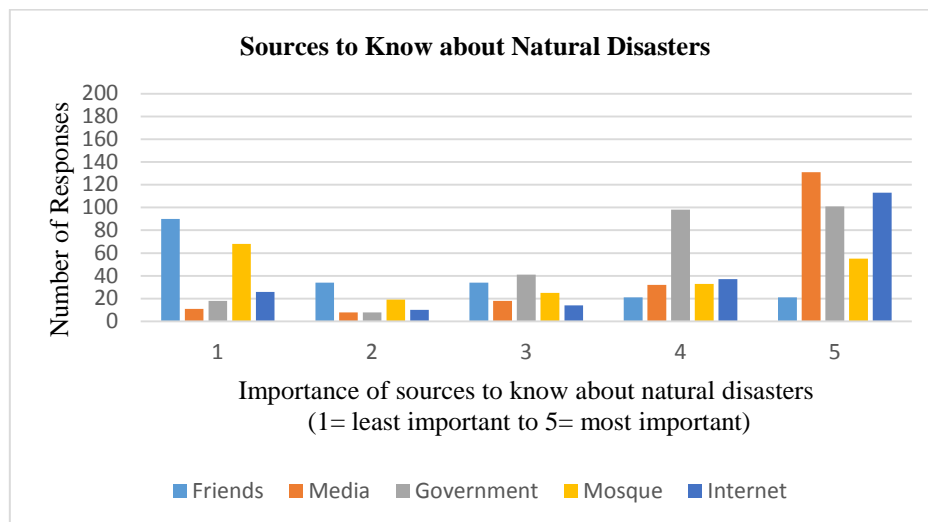
Figure 6.6: Scale of importance for the impacts of natural disasters



According to the scale of importance in Figure 6.6, participants felt environmental, human and economic impacts of natural disasters were very important, especially the impacts on the environment. However, participants thought that the impacts of natural disasters on the social relations between people are of less importance. Such findings shows that participants were aware of the environmental and economic impacts of natural disasters.

As for the importance of different sources of information about natural disasters, results are shown in Figure 6.7.

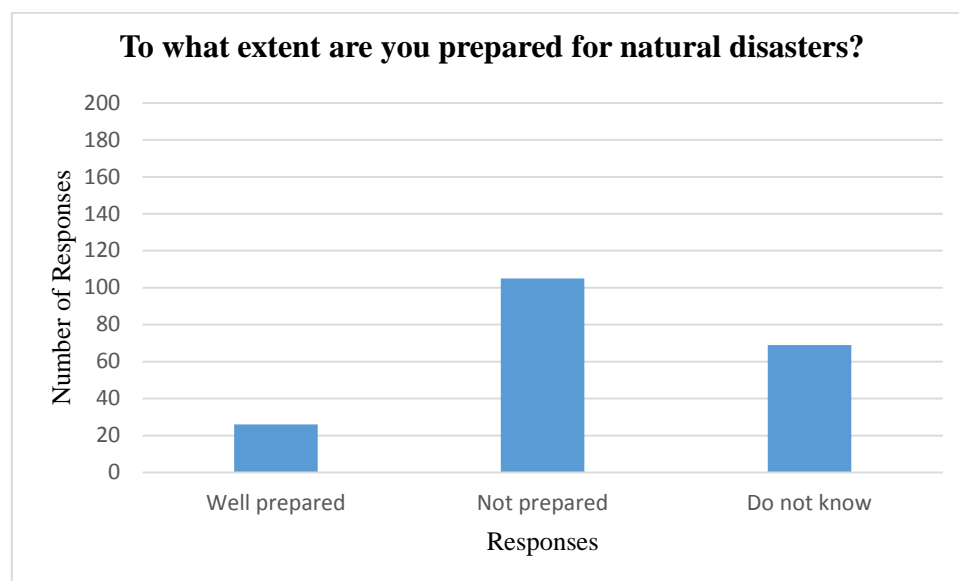
Figure 6.7: Scale of importance of different sources to know about natural disasters



As can be seen from Figure 6.7, the majority of participants thought that the different forms of media, internet and the government were the most important sources of information to know about natural disasters in their areas. However, friends, according to the participants, were not an important source of information about natural disasters. As for the mosque, only around one quarter of participants thought that it is a very important source of information to know about natural disasters. Such findings show that the mosque had not played an effective role in educating people about the causes of natural disasters, their impacts and effective ways to reduce their impacts.

If people have good knowledge about the possibility of occurrence of natural disasters in their provinces and their destructive impacts, they should be prepared to reduce the impacts of natural disasters. Participants in this study were asked whether they were prepared to face possible natural disasters:

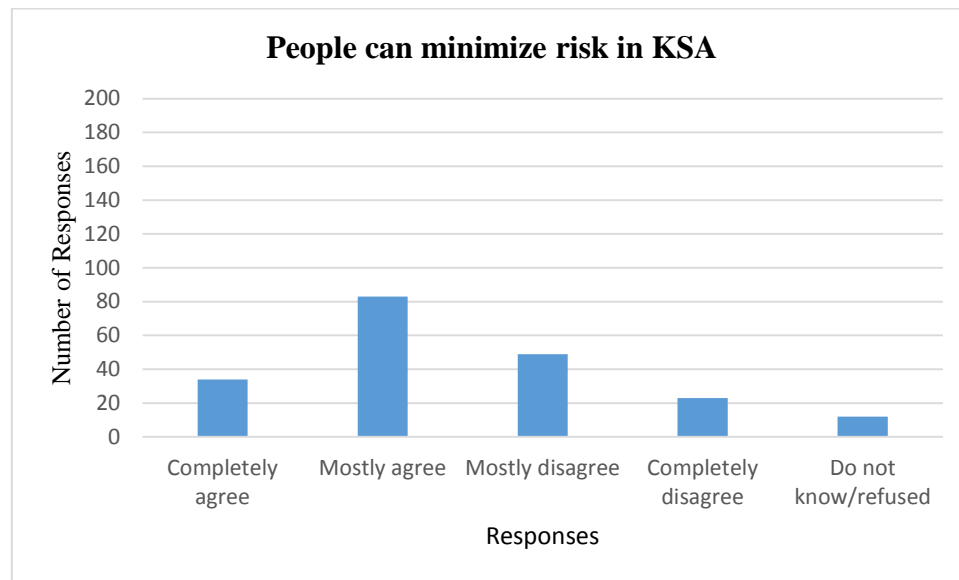
Figure 6.8: Participants' preparation to natural disasters



As can be seen from Figure 6.8, the majority of participants were not prepared to face the destructive impacts of natural disasters in their provinces. Only one eighth of participants said that they were ready to face natural disasters. This shows lack of knowledge and education on how to effectively reduce the destructive impacts of natural disasters and overcome them, which supports the findings above that the majority of participants lack important knowledge about natural disasters.

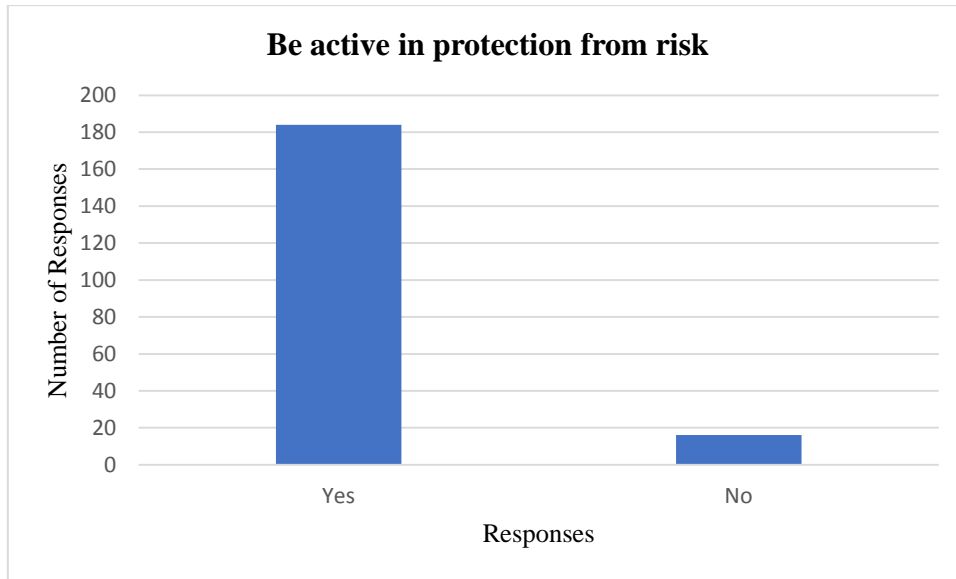
Although the majority of participants were not prepared and do not know how to face natural disasters in their provinces, nearly half of them believed that people could help to reduce the destructive impacts of natural disasters on their country.

Figure 6.9: Participants' responses on people in KSA can minimize risk



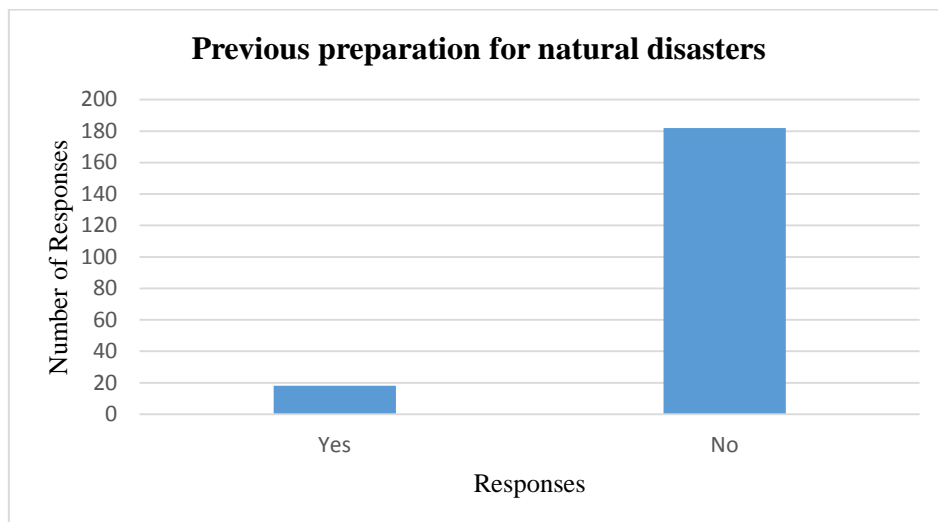
As is shown in the Figure 6.9, over half of the participants either completely agreed or mostly agreed that people can help to reduce the destructive impacts of natural disasters in their country. Such results indicate that there is willingness for the majority of the participants to take part in any action to face natural disasters, but there is lack of knowledge and training on how to face natural disasters. Such findings are also important challenge to the fatalistic view of natural disasters because if the participants held such a view, they should have shown a passive response to this question. The fatalistic view was also challenged by the participants who were interested in taking part in active roles to reduce the destructive impacts of natural disasters. The majority of participants, as is shown in Figure 6.10, were ready to be active in protection from the risk of natural disasters.

Figure 6.10: Would you like to be active in taking steps to protect your home and family from the risks of natural disasters?



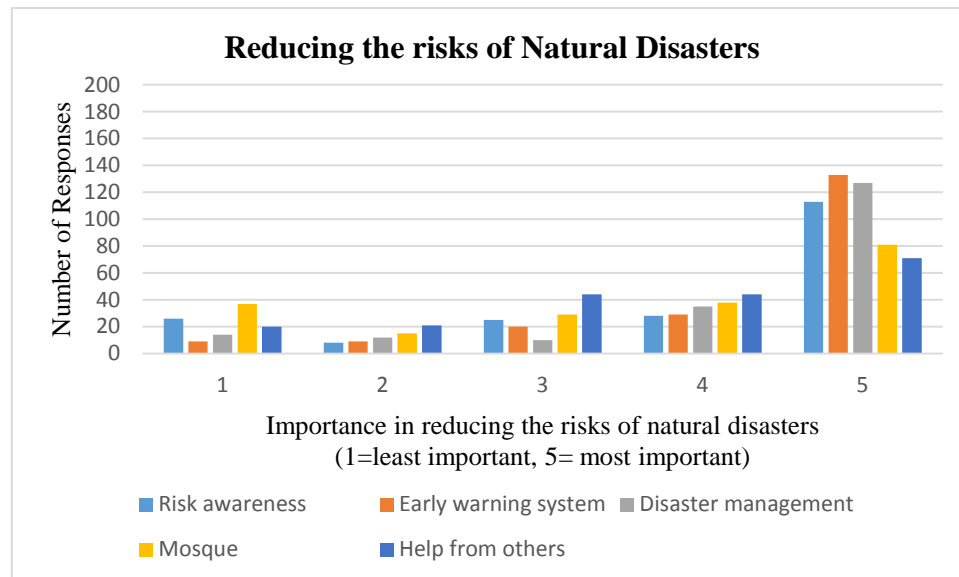
As is shown in Figure 6.10, the vast majority of participants in the study were very interested in taking part in actions to reduce the destructive impacts of natural disasters in their provinces. However, the majority of them had not received any training before to prepare for natural disasters, as is shown in Figure 6.11.

Figure 6.11: Did you take part in any preparation exercise in Saudi Arabia about natural disasters?



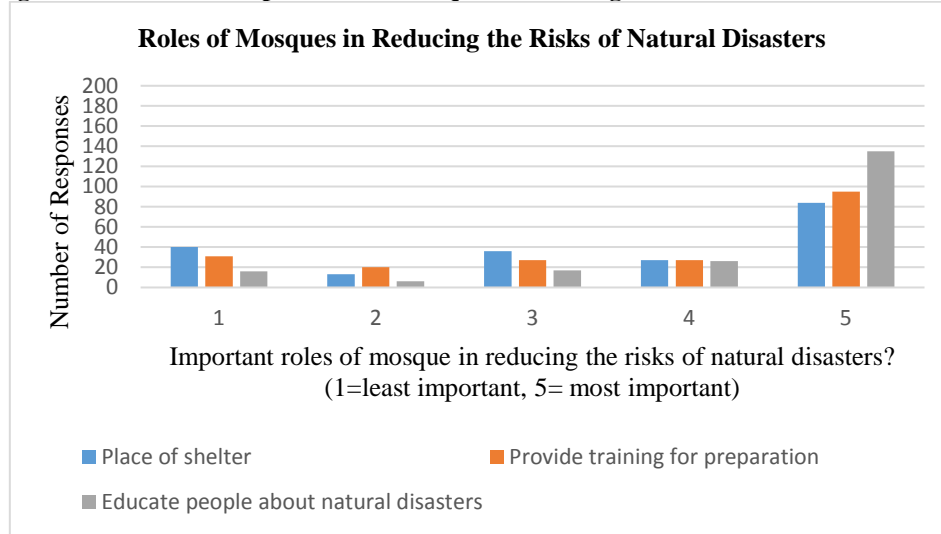
Although the participants did not have much knowledge about natural disasters in their provinces, they showed knowledge of the important factors that might warn them of natural disasters and reduce their risks, as is shown in Figure 6.12.

Figure 6.12: Scale of importance in reducing the risks of natural disasters



As can be seen from Figure 6.12, the majority of participants thought that Early Warning Systems, Disaster Management and Risk Awareness were very important factors in reducing the effects of natural disasters, while over than a third of the participants said that the mosque can play a role in reducing the effects of natural disasters. To know more about the role of mosque, participants were asked about the importance of different roles that a mosque can play to reduce the effects of natural disasters:

Figure 6.13: Scale of importance of mosque in reducing the effects of natural disasters



As can be seen from Figure 6.13, the participants thought that the mosque can play very important roles in reducing the risks of natural disasters. Around two thirds of the participants said that the most important role that a mosque can play is to educate people about reducing the risks of natural disasters, while about a half of them thought that the mosque could be very important to provide training to face disasters. However, less than the half of the participant believed that a mosque could be a place of shelter.

6.2.1.1 Summary

Results showed that conflicts, earthquakes and floods were the main natural disasters expected in the Kingdom of Saudi Arabia. The majority of participants did not seem to have good knowledge about natural disasters in their provinces in terms of occurrence, risks and how to face them. The majority of participants did not know whether they might be affected by natural disasters, and they were not very worried. That is because they were not prepared and they had not received any previous training to face natural disasters in their provinces although they were enthusiastic to help in reducing the risks of natural disasters in their provinces.

The important sources of knowledge about natural disasters in the participants' provinces were mainly the government, the media and the internet. To reduce the risks of natural disasters in general, the majority of participants thought that early warning systems, disaster management and risk awareness are very important factors. The participants also considered environmental and economic impacts as the most important impacts of natural disasters. However, the

majority of participants showed shallow knowledge about natural disasters in their provinces and how to face them, which means that the means of the government to educate people about the risks of natural disasters and how to face them are not effective.

The majority of the participants held a religious interpretation of natural disasters. They considered natural disasters as a test, an anger or a sign from Allah, but less likely to be a punishment. However, the extreme version of fatalistic view is not strongly supported by the majority of participants who thought that natural disasters can be a test from God more than punishment. They also were willing to take part in any efforts to face the risks of natural disasters in their provinces. In addition, the majority of participants did not neglect that natural disasters can be a result of natural processes or caused by man's negligence of nature. Hence, if the majority of participants believed in the extreme version of the fatalistic view, they would not have held such views about natural disasters and they would not have shown any willingness to face natural disasters because it is their inevitable destiny that cannot be prevented or changed, which indicates that the extreme version of the fatalistic view is not supported by these results.

Although the majority of the participants did not think the mosque is as important as early warning systems or risk awareness in reducing the risks of natural disasters in their provinces, they still thought a mosque can have role in reducing the risks of natural disasters in their provinces. That is, the mosque can be a good place to educate people, provide training and a place of shelter to them when natural disasters occur.

6.2.2 Results by Gender

The life of women in the Kingdom of Saudi Arabia is different from the life of women in the west. As mentioned in Section 4.2.2, gender segregation is applied at nearly all levels in life (Alkahtani et al., 2013). Therefore, the Saudi women go to only female schools and universities, and they work in all female settings where they are not allowed to mix with males. The Saudi woman does not work at any kind of job, such as civil defence, the army or engineering. Such jobs are exclusive to men, while the work setting for woman in the Kingdom of Saudi Arabia is restricted to mainly social services, such as National Health Service or

education. Therefore, the researcher felt that it is very important to investigate if there is any gender effect on the results of this study in the Kingdom of Saudi Arabia. The researcher expects that there will be difference between the results of male and female participants due to the different experiences they both go through in the Saudi society.

The results in the previous section were analysed by overall participants, male and female. In this section, results were analysed according to the male and female participants in the study. As is mentioned in Section 5.5.1, 100 male and 100 female participants replied to the questionnaire in this study. Therefore, the presentation of results in this section will be according to the responses of the males compared to the females. The results of male participants will be presented first, then compared with the results of female participants. Tables 6.1, 6.2 and 6.3 present the comparison between male and female participants:

Table 6.1: Male and female participants' responses on disasters

No	Question	Options	Male	Female
1	Possible causes behind natural disasters in the four provinces	Earthquake	58	57
		Flood	49	41
		Epidemic	42	37
		Volcanic	39	24
		Tornado	34	28
		Landslide	29	15
		Tsunami	35	37
		Conflicts	55	70
2	Your province might be affected by weather-related disasters	Yes	40	33
		No	14	10
		Do not know	46	57
3	How worried are you about the occurrence of disasters in your province?	Very worried	8	4
		Fairly worried	41	34
		Not very worried	37	35
		Not at all worried	14	26
		Do not know	0	1
4	Possible causes of natural disasters	From Allah	55	52
		Natural process	5	9
		Disregard for environment	9	7
		Human activity	3	2
		All above	42	42
		Do not know	0	1
5	Faith reasons of weather-related disasters	Anger sign from Allah	5	18
		Test from Allah	18	20
		Punishment from Allah	5	9
		All mentioned above	61	43
		Do not know	13	10
6	How prepared are you to face natural disasters?	Well prepared	20	6
		Not prepared	56	49
		Do not know	24	45
7	People in the KSA can minimize the risks of natural disasters	Completely agree	19	15
		Mostly agree	42	41
		Mostly disagree	21	28
		Completely disagree	13	10
		Do not know/refused	5	7
8	Interested in being active to protect your province from the risks of natural disasters?	Yes	89	95
		No	11	5
9	Taking part before in any preparation exercise in the KSA about natural disasters?	Yes	11	7
		No	89	93

Numbers shown under male and female columns in Table 6.1 represent the number of participants who chose the option on the left side of the table. In some questions, participants were allowed to choose more than one option, so more than 100 choices are found for each gender in question 1, for example, although the number of participants in each gender is only 100. While in question 2, only 100 choices are found under each gender because participants were asked to choose one option.

As can be seen from question 1 in Table 6.1, there are no big differences between the responses of male and female participants on the main causes of natural disasters in their regions, namely conflicts, earthquakes and floods¹⁰. However, the female participants were a little bit more concerned about conflicts than the male participants were. Although the researcher expected floods to be the main concern to male and female participants, they were more worried about conflicts, which is attributed to the civil unrest in the neighbouring countries such as Syria, Iraq and Yemen.

Similar to the overall results, both male and female participants, as is shown in question 2 in Table 6.1, do not have much knowledge about natural disasters so they do not know whether their provinces might be affected by natural disaster. This indicates that the means of the Saudi government on educating people about natural disasters in their provinces is not effective.

By comparing between the worriedness of male and female participants, nearly similar numbers were “Very Worried”, “Fairly Worried” or “Not Very Worried” about the break out of natural disasters in their provinces. However, more female than male participants were “Not Worried at All” about the break out of natural disasters in their provinces, as is shown in question 3 in Table 6.1. Such results can also be attributed to the participants’ lack of knowledge about natural disasters in their provinces.

As for the possible causes of natural disasters, the opinions of male and female participants were nearly identical. Around half of each male and female participants said that “They are from Allah”. The other half of male and female participants said that natural disasters might be

¹⁰ This unexpected result will be discussed in detail in Section (7.2).

caused by natural processes, disregard of natural environment or human activity, as is shown in question 4 in Table 6.1.

Such results indicate that both male and female participants supported a religious interpretation of the causes of natural disasters. However, they did not completely ignore other possible causes which are not religious, which indicates that both male and female participants in this study did completely support a fatalistic view of natural disasters.

As can be seen from question 5 in Table 6.1, the majority of female participants and male participants thought that natural disasters can be an anger sign, a test or a punishment from Allah. However, the number of female participants who considered natural disasters as anger sign was nearly three times higher than the number of male participants. Importantly, it can be noted that both male and female participants in this study considered natural disasters as a test or anger sign from Allah more than punishment. Hence, the extreme version of the fatalistic view, which considers natural disasters as mainly a punishment from Allah, is not supported in this study.

Similar to the overall results, the majority of male and female participants were either “Not Prepared” or “Do not know” how to face the risks of natural disasters, as is shown in question 6 in Table 6.1. Only 20% of male participants were prepared to face natural disasters compared to only 6% of female participants who were prepared to face natural disasters.

Although the majority of male participants were not prepared to face natural disasters, over 60 percent of them “completely agreed” or “mostly agreed” that people can help to minimize the risks of natural disasters in the Kingdom of Saudi Arabia, as is shown in question 7 in Table 6.1. Here, the male and female participants’ results are reflective of overall results and confirm the previous findings above that the majority of participants did strongly support the fatalistic view of natural disasters as inevitable destiny that cannot be changed or faced. On the contrary, the participants here strongly believe that people in the Kingdom of Saudi Arabia can help to minimize the risks of natural disasters. Such a view was supported by the willingness of male and female participants themselves to face the risks of natural disasters. The majority of male

and female participants said that they would like to be active in protection from the risks of natural disasters, as is shown in question 8 in Table 6.1.

However, similar to overall results, the majority of male and female participants did not take any part in previous preparation on how to face the risks of natural disasters, as is shown in question 9 in Table 6.1. Such findings, which are similar to the overall results, indicate a lack of programs and schemes that provide training and education to people on how to prepare to and face the risks of natural disasters in the Kingdom of Saudi Arabia.

Male and female participants were also asked about the importance of different impacts of natural disasters. As is shown in question 1 in Table 6.2 male participants considered economic impacts as the most important impacts of natural disasters, whereas female participants considered environmental impacts as the most important. Similar results can be found with regards to the view of human impacts where nearly half of the male and female participants considered them important. However, a difference can be noticed in the social impacts where the number of male responses (42) was nearly double that of female responses (23).

Similar to overall results, when male and female participants were asked about the importance of different sources to know about natural disasters, they said that the media, government and the internet were the most important sources to know about natural disasters while friends and the mosque were of less important, as is shown in question 2 in Table 6.2.

Table 6.2: Male and female participants' responses on the scale¹¹ of importance for the impacts of natural disasters and source to know about natural disasters

No	Question	Options	Scale	Male	Female
1	Importance of the impacts of weather-related disasters	Economic impacts	1	14	13
			2	4	10
			3	15	23
			4	15	15
			5	52	39
		Social impacts	1	11	21
			2	8	16
			3	24	25
			4	15	15
			5	42	23
		Human impacts	1	10	11
			2	6	7
			3	15	13
			4	24	16
			5	45	53
		Environmental impacts	1	9	6
			2	8	5
			3	17	10
			4	16	16
			5	50	63
2	Importance of different sources to know about natural disasters	Friends	1	44	46
			2	18	16
			3	18	16
			4	11	10
			5	9	12
		Media	1	9	2
			2	3	5
			3	9	9
			4	16	16
			5	63	68
		Government	1	8	10
			2	4	4
			3	22	19
			4	18	17
			5	51	50
		Mosque	1	38	30
			2	9	10
			3	10	15
			4	18	15
			5	25	30
		Internet	1	10	16
			2	4	6
			3	10	4
			4	22	15
			5	54	59

¹¹ 1= least important to 5= most important

As for the importance of different factors in reducing the risks of natural disasters, the majority of male and female participants considered early warning systems, disaster management and risk awareness as the most important factors to reduce the risks of natural disasters, as is shown in question 1 in Table 6.3. However, the importance of these factors to male participants was a little bit higher than that of female participants.

As for the role of mosque in reducing the effects of natural disasters, both male and female participants said that the mosque is very important to “educate people about natural disasters”. Also, the mosque was seen, by male and female participants, as an important place to “provide training for preparation” to face natural disasters, as is shown in question 2 in Table 6.3. Such results are indicative of overall results and shows that the mosque can be an important place to educate people and provide training about the risks of natural disasters.

Table 6.3: Male and female participants' responses on the importance of different factors in reducing the risks of natural disasters and the importance of different roles of the mosque in disaster risk reduction.

No	Question	Options	Scale	Male	Female
1	Importance of different factors in reducing the risks of natural disasters in the kingdom	Risk awareness	1	14	12
			2	2	6
			3	7	14
			4	13	15
			5	64	49
		Early warning systems	1	4	5
			2	4	5
			3	6	14
			4	13	16
			5	73	60
		Disaster Management	1	6	8
			2	6	6
			3	4	8
			4	15	20
			5	69	58
		Mosque	1	19	18
			2	7	8
			3	14	15
			4	13	19
			5	41	40
		Help from others	1	10	10
			2	9	12
			3	8	26
			4	22	22
			5	41	30
2	Importance of different roles of a mosque to face the risks of natural disasters	Place of shelter	1	25	15
			2	10	3
			3	15	21
			4	10	17
			5	40	44
		Provide training for preparation	1	15	16
			2	16	4
			3	10	17
			4	13	14
			5	46	49
		Educate people about natural disasters	1	8	8
			2	2	4
			3	5	12
			4	14	12
			5	71	64

6.2.2.1 Summary

The comparison between the responses of male and female participants in this study shows that overall results are indicative of results by gender. Therefore, there was an obvious similarity between the results of male participants and female participants in the majority of responses.

The majority of male and female participants considered earthquakes, conflicts and floods as the main reasons behind natural disasters. However, the majority of male and female participants did not know whether their areas might be affected by natural disasters. Therefore, the majority of male and female participants were either fairly worried or not very worried about natural disasters, which indicates lack of knowledge and training to Saudi people on how to face the risks of natural disasters.

As for the main reasons behind natural disasters, the majority of male and female participants said “They are from Allah”. They also said natural disasters could result from natural processes, disregard of environment and human activity. According to their faith, over than a half of male and female participants said that natural disasters are an anger sign, a test and punishment from Allah. However, the number of male and female participants who said that natural disasters can be a test or an anger sign from Allah was higher than the number of male and female participants who said that natural disasters are a punishment from God to sinful people. Such findings indicate that the extreme version of the fatalistic view of natural disasters as a punishment from God to sinful people is not supported in this study. Such conclusion was also supported by the thoughts of male and female participants that people can help to minimize the risks of natural disasters in the Kingdom of Saudi Arabia. The male and female participants themselves were enthusiastic to take part in any efforts in disaster risk reduction in their provinces. If such participants had held a fatalistic view of natural disasters, they would have refused to help in disaster risk reduction in their provinces because it is not allowed in religion to face the punishment of God.

Similar to the overall results, the majority of male and female participants considered media, the internet and the government as the most important sources to know about natural disasters, while the mosque and friends were of less importance. Although the majority of male and female participants thought that the mosque was not very important as a source to know about

natural disasters, they still thought it can play an important role in educating and training people to face natural disasters.

Similar to the overall results, the majority of male and female participants said that early warning systems, disaster management and risk awareness are very important factors in reducing the risks of natural disasters. All in all, overall results are indicative of results by gender, which is contrary to the expectations of the researcher. This important finding will be discussed in detail in the next chapter.

6.2.3 Results by Province

In addition to the analysis of results by overall results and gender differences, results were also analysed according to the four provinces involved in the study, namely Riyadh Province, Makkah Province, Eastern Province and Northern Province. Such an analysis is felt by the researcher to be very important because participants in some provinces, such as Riyadh and Makkah provinces, might consider some natural disasters more important than others. These provinces, as was shown in Section 4.2.4, has witnessed the most destructive floods in the last two decades in the Kingdom of Saudi Arabia. Earthquakes are also expected to be very important in Makkah province, which is located on an area prone to earthquakes. Therefore, the results for every question will be presented according to the four provinces in this section. As was explained in Section 5.5.1, the total number of participants from every province was 50, divided into 25 male and 25 female participants. Results by provinces are presented by Tables 6.4, 6.5 and 6.6.

Table 6.4: Results by provinces

No	Question	Options	Riyadh	Makkah	Northern Province	Eastern Province
1	Possible causes behind natural disasters in the four provinces	Earthquake	24	39	25	27
		Flood	16	33	18	23
		Epidemic	18	23	22	16
		Volcanic	9	21	17	16
		Tornado	9	21	17	15
		Landslide	9	16	11	10
		Tsunami	18	24	13	17
		Conflicts	39	31	42	31
2	Your province might be affected by weather-related disasters	Yes	10	28	22	13
		No	9	5	5	5
		Do not know	31	17	23	32
3	How worried are you about the occurrence of disasters in your province?	Very worried	4	2	2	4
		Fairly worried	12	22	18	23
		Not very worried	20	17	20	15
		Not at all worried	13	9	10	8
		Do not know	1	0	0	0
4	Possible causes of natural disasters	From Allah	28	24	24	27
		Natural process	5	5	5	2
		Disregard for environment	2	3	3	4
		Human activity	0	4	4	0
		All above	18	23	23	22
		Do not know	1	0	0	0
5	Faith reasons of weather-related disasters	Anger sign from Allah	3	4	7	9
		Test from Allah	11	9	6	12
		Punishment from Allah	4	0	2	3
		All mentioned above	30	31	27	26
		Do not know	3	6	10	5
6	How prepared are you to face natural disasters?	Well prepared	5	5	4	12
		Not prepared	26	30	27	22
		Do not know	19	15	19	16
7	People in the KSA can minimize the risks of natural disasters	Completely agree	15	3	7	9
		Mostly agree	14	21	18	29
		Mostly disagree	11	19	10	9
		Completely disagree	5	4	11	3
		Do not know/refused	5	3	4	0
8	Interested in being active to protect your province from the risks of natural disasters?	Yes	47	48	40	49
		No	3	2	10	1
9	Taking part before in any preparation exercise in the KSA about natural disasters?	Yes	1	9	4	4
		No	49	41	46	46

Numbers shown under each province in Table 6.4 represent the number of participants who chose the option on the left side of the table. In some questions, participants were allowed to choose more than one option, so more than 50 choices are found for each province in question 1, for example, although the number of participants in each province is only 50. While in question 2, only 50 choice are found under each province because participants were asked to choose one option.

As is shown in Table 6.4, possible causes of disasters varied by province. Conflicts was the main possible reason behind disasters in Riyadh Province, the Northern Province and the Eastern Province, while Floods was the main possible cause of disasters in Makkah Province. Such a result was expected by the researcher because Riyadh, which is the capital of the Kingdom of Saudi Arabia, is very worried about the civil unrest in the neighbouring countries, namely Syria, Iraq and Yemen. Since the Kingdom of Saudi Arabia is leading the Arab Coalition for the Support of Legitimacy in Yemen, the people of this capital are naturally very concerned about the threat that might come from Yemen. As for the Northern Province, it is located on the borders of Syria and Iraq, which has been witnessing escalation in violence and fighting. Therefore, the people of the Northern Province are expected to be very worried about their safety. Conflicts were the most important reasons behind disasters in the opinion of participants from the Eastern Province because this province has the main sources of oil in the kingdom so it represents the main economic power for the Kingdom of Saudi Arabia. This province is very close to Bahrain, which had civil unrest at the time of study, and the Eastern Province is close to Iran, which is the troublemaker in Arabian Peninsula. As for Makkah Province, Floods and Earthquakes were seen as the main causes of disasters in this province. The researcher expected such result because, as mentioned in Section 4.2.4, Makkah is prone to earthquakes and floods, and it has witnessed destructive floods in the last two decades. Earthquakes were the second important reason in Riyadh Province, the Northern Province and The Eastern Province. It is surprising that Earthquakes was more important than Floods for the people in Riyadh Province, the Northern Province and the Eastern Province although these provinces have not recorded any earthquake and some of them, such as Riyadh Province, has witnessed the most violent floods in the last two decades in the kingdom and this. It is possible that participants' lack of knowledge and information about disasters in their provinces made them choose earthquakes although such disasters are not likely to occur in their provinces.

Differences can also be noticed when participants were also asked if their province might be affected by weather-related disasters, as is shown in question 2 in Table 6.4. The majority of participants from Riyadh and the Eastern provinces were indecisive so they did not know whether their provinces might be affected by weather-related disasters or not. In contrast, the majority of participants in Makkah Province were more decisive and thought that their province might be affected by weather-related disasters. As for the Northern Province, similar numbers of participants said either “Yes” or “Do not Know”. Hence, the majority of participants from the four provinces, except Makkah, were not decisive whether their provinces might be affected by weather-related disasters. People of Makkah were more decisive because they have witnessed many destructive floods during the last two decades. The responses of participants from Riyadh were expected to be similar to that of Makkah because Riyadh has also witnessed many floods in the last two decades, but the responses of participants from Riyadh were surprising. Such results might be attributed to lack of knowledge and information about disasters in their provinces. Such a conclusion is supported by the responses of participants on whether they were worried about the occurrence of weather-related natural disasters in their provinces. Participants from the four provinces were not very worried about the occurrence of disasters in their provinces, as is shown in question 3 in Table 6.4.

As can be seen from question 3 in Table 6.4, the majority of participants in Riyadh and the Northern Area were “Not very Worried” about weather-related disasters in their provinces. As mentioned above, such results about Riyadh was unexpected because it has witnessed many destructive floods over the last two decades, especially in the last five years. In contrast, the majority of participants in Makkah and the Eastern Area were “Fairly Worried” about weather-related disasters in their provinces. The results of Makkah Province were expected by the researcher to be “Very Worried” because the most recorded destructive flood in the history of the Kingdom of Saudi Arabia occurred in Makkah Province, particularly Jeddah city, in 2009 leading to the death of 163 people and injury of 11,640 people. In addition to the casualties and injuries, the financial loss was high; it reached the peak of 3 billion Saudi Riyal, in addition to 5.1 billion Saudi Riyal as a compensation to affected people (Momani and Fadil, 2010). As for the Eastern Province, they were “Fairly Worried” about weather-related disasters in their province because it is a coastal area so they might have floods or tsunamis. It is noticed that participants who were “Very Worried” were less than 5 percent in all provinces.

There was similarity in the response of participants from the four provinces with regards to the possible causes of natural disasters. As can be seen from question 4 in Table 6.4, the majority of participants in the four provinces said that weather-related disasters “They are from Allah”. However, “All above” which refers to “They are natural processes”, “People’s disregard for natural environment” and “They are caused by human activity” was also important. Such results do not also support an extreme version of the fatalistic view of natural disasters which states that natural disasters are inevitable punishment from God to sinful people and this punishment cannot be faced or changed. If the participants in this study had held such a view, they would have disregarded other possible causes of natural disasters. Such conclusion is also supported by the results in question 5 in Table 6.4. The majority of participants in the four provinces said that weather-related disasters can be caused by “All mentioned above”, namely “Anger sign from Allah”, Test from Allah” or “Punishment from Allah”. However, it can be noticed that “Punishment from Allah” was of less importance in the four provinces, especially in Makkah Province. Instead of being a punishment from God to sinful people, which is the claim of the extreme version of the fatalistic view of natural disasters, they were considered by the participants in this study as a test or anger sign from God more than being a punishment.

As for the preparation to face natural disasters, the majority of participants from the four provinces were either “Not Prepared” for natural disasters or “Do not Know”, as is shown in question 6 in Table 6.4.

Participants from the four provinces showed disparity when they were asked if people in the Kingdom of Saudi Arabia could minimize the risks of natural disasters, as can be seen from question 7 in Table 6.4. Overall, the participants from the four provinces did not reject the idea that people in the kingdom can help to minimize the risks of natural disasters, but they might not be completely confident they can do it because they lack knowledge, information and training to face the risks of natural disasters in the Kingdom of Saudi Arabia.

Although there were differences in participants’ responses on whether people in the kingdom can help to minimize the risks of natural disasters, the majority of participants in the four provinces were interested in being active to protect their province from the risks of natural disasters, as is shown in question 8 in Table 6.4. Such results, which are identical to the overall

results in Section 6.2.1, indicate that there is no support for the extreme version of fatalistic view of natural disasters because if the participants in this study had held such a view, they would have chosen “No” to answer this question. That is, because they, according to the fatalistic view, can do nothing to change their inevitable divine punishment by God.

However, the majority of participants from the four provinces had not had any preparation before to face the risks of natural disasters in the kingdom, as is shown in question 9 in Table 6.4. Such results, which are similar to the overall results mentioned in Section 6.2.1, confirm that there is a lack of effective scheme for disaster risk reduction in the four provinces under study.

Participants from the four provinces showed differences in their responses to the importance of the impacts of weather-related disasters and sources to know about natural disasters, as is shown in Table 6.5.

Table 6.5: Scale¹² of importance for the impacts of natural disasters and source to know about natural disasters

No	Question	Options	Scale	Riyadh	Makkah	Northern Province	Eastern Province
1	Importance of the impacts of weather-related disasters	Economic impacts	1	10	4	10	3
			2	2	2	7	3
			3	9	8	8	13
			4	9	11	3	7
			5	20	25	22	24
		Social impacts	1	8	11	7	6
			2	9	7	6	2
			3	13	13	10	13
			4	8	10	5	7
			5	12	9	22	22
		Human impacts	1	8	8	3	2
			2	6	1	5	1
			3	7	5	9	7
			4	8	9	5	18
			5	21	27	28	22
		Environmental impacts	1	9	4	2	0
			2	4	0	5	3
			3	4	4	4	15
			4	9	11	4	8
			5	24	31	35	24
2	Importance of different sources to know about natural disasters	Friends	1	19	22	24	25
			2	11	10	10	3
			3	8	8	7	11
			4	5	5	3	8
			5	7	5	6	3
		Media	1	5	4	1	1
			2	1	2	4	1
			3	4	10	6	1
			4	6	8	9	9
			5	34	29	30	38
		Government	1	7	3	6	2
			2	2	3	2	1
			3	11	10	14	6
			4	8	11	6	7
			5	22	23	22	34
		Mosque	1	26	7	18	17
			2	4	6	2	7
			3	3	8	9	5
			4	8	5	10	10
			5	9	24	11	11
		Internet	1	9	9	4	4
			2	1	4	4	1
			3	6	4	3	2
			4	4	1	6	16
			5	30	24	33	27

As can be seen from question 1 in Table 6.5, economic impacts of natural disasters were important in the four provinces while social impacts were more important in the Northern

¹² 1= least important to 5= most important

Province and Southern Province than in Riyadh Province and Makkah Province. As for human impacts and environmental impacts, there were both important in the four provinces

Overall, differences were noticed between the four provinces. Environmental impacts was one of the most important impacts caused by weather-related disasters in Riyadh Province, Makkah Province and the Northern Province, followed by human impacts. While economic impacts were more important than social impacts in Riyadh province and Makkah Province, they were at same level of importance in the Northern Province. The Eastern Province was different from the three provinces where human impacts were more important than any other impacts caused by weather related disasters in the Eastern Province.

Participants from the four provinces also showed differences in their responses to the importance of different sources to know about natural disasters. As can be seen from question 2 in Table 6.5, media, the internet and the government were generally important sources of information about natural disasters while friends and the mosque were of less importance as sources of information about natural disasters in Riyadh Province, the Northern Province and the Eastern Province. However, media, the internet, the government and mosque were considered by the majority of participants in Makkah as important sources of information about natural disasters while friends were not important source.

Participants from the four provinces were asked about the importance of different factors in reducing the risks of natural disasters in the kingdom. Results showed differences between the four provinces, as is shown in question 1 in Table 6.6.

Table 6.6: Importance of different factors in reducing the risks of natural disasters and the importance of different roles of the mosque in disaster risk reduction.

No	Question	Options	Scale	Riyadh	Makkah	Northern Province	Eastern Province
1	Importance of different factors in reducing the risks of natural disasters in the kingdom	Risk awareness	1	11	3	10	2
			2	0	3	4	1
			3	5	5	10	5
			4	7	11	4	6
			5	27	28	22	36
		Early warning systems	1	6	0	3	0
			2	3	1	5	0
			3	6	7	4	3
			4	6	6	7	10
			5	29	36	31	37
		Disaster Management	1	7	2	4	1
			2	6	3	3	0
			3	2	4	1	5
			4	6	10	12	7
			5	29	31	30	37
		Mosque	1	15	2	7	13
			2	5	2	4	4
			3	8	7	11	9
			4	6	10	11	11
			5	16	29	23	13
		Help from others	1	5	5	6	4
			2	9	4	3	5
			3	12	8	11	13
			4	8	15	7	14
			5	16	18	23	14
2	Importance of different roles of a mosque to face the risks of natural disasters	Place of shelter	1	12	4	18	6
			2	3	2	5	3
			3	9	6	11	10
			4	6	5	6	10
			5	20	33	10	21
		Provide training for preparation	1	12	1	10	8
			2	5	5	4	6
			3	4	7	9	7
			4	5	8	6	8
			5	24	29	21	21
		Educate people about natural disasters	1	6	1	5	4
			2	3	1	0	2
			3	5	4	4	4
			4	4	8	4	10
			5	32	36	37	30

As is shown in question 1 in Table 6.6, early warning systems was the most factor in the four provinces to reduce the risks of natural disasters in the kingdom. However, there were differences in the importance of the other factors. There was similarity in the importance of these factors between Riyadh Province and the Eastern Province in the importance of these factors. That is, the majority of participants in Riyadh Province and the Eastern Province thought the government, early warning systems, disaster management, and risk awareness were

the most important factors in reducing the risks of natural disasters, while the mosque and help from others were less important. However, the mosque was nearly at the same scale of the importance of disaster management and risk awareness in Makkah Province and the Northern Province.

As for the importance of the different roles of a mosque to face the risks of natural disasters, there were also differences in the responses of the participants from the four provinces. As is shown in the question 2 in Table 6.6, the majority of participants in the four provinces said that the most important role for mosque is to educate people about natural disasters. However, there were differences in the other roles for mosque. While the roles of “Place of shelter” and “provide training”, compared to “Educate people about natural disasters”, were of less importance in Riyadh Province, the Northern Province and the Eastern Province, they were of equal importance in Makkah Province. Such results indicate that the most important role for the mosque in disaster risk reduction is educating people about effective disaster risk reduction.

6.2.3.1 Summary

Similarity and differences between overall results and results by province can be noticed in the majority of the responses of participants from the four provinces.

Conflicts, earthquakes and floods, similar to overall results, were found to be the most possible causes of disasters by participants from the four provinces. The majority of participants from the four provinces were not prepared to face natural disasters, and they had not had any training before to face disasters. Such results, as discussed above by the researcher, indicate that schemes and policies in the four provinces to face disasters are not effective.

The majority of participants from the four provinces, similar to the overall results, said that weather-related disasters are from God, but they were seen by participants as a test from God more than being a divine punishment to sinful people. The majority of participants from the four provinces did not also reject the idea that natural disasters can result from natural processes or man’s disregard of nature. Moreover, the majority of participants from the four provinces were interested in being active and taking part in the protection against weather-related disasters, and they thought that people in the Kingdom of Saudi Arabia can help to mitigate the

negative impacts of natural disasters. Such results, as discussed above, shows that the extreme version of the fatalistic view of natural disasters, which states that natural disasters are divine inevitable punishment from God to sinful people who cannot change or reduce the impacts of such divine punishment, is not supported in this study. On the contrary, the majority of participants in this study were enthusiastic to be active in minimizing the impacts of natural disasters.

In the four provinces, environmental impacts, similar to overall results, were found to be the most important impacts for weather-related disasters, followed by human and economic impacts. Also, the media was found to be the main source to know about weather-related disasters by the majority of participants in all provinces, except in the Northern Province where the internet was found to be the most important source. Participants from the four provinces said that early warning systems were the most important factor to reduce the risks of weather-related disasters.

Difference between overall results and results by province can be noticed in the role of mosque in disaster risk reduction. The majority of participants in the overall results considered early warning systems as the most important factor in disaster risk reduction, then followed by disaster management and risk awareness, while the mosque was at low scale of importance. In the results by province, early warning systems were seen as the most important factor in disaster risk reduction, but the mosque, especially in Makkah Province, was seen at the same scale of importance as disaster management and risk awareness. As for the most important role of the mosque in disaster risk reduction, the most important role was to educate people about natural disasters.

Some differences between overall results and results by province can also be noticed in the participants' responses on the ability of people to minimize the risks of natural disasters in the Kingdom of Saudi Arabia. For example, the majority of participants in Riyadh Province and Makkah Province either mostly agreed or mostly disagreed with this opinion, while the majority of participants in the Eastern Province and the Northern Province mostly agreed that people can minimize the risks of weather-related disasters. Likewise, the majority of participants in Riyadh Province and the Northern Province were not very worried about-

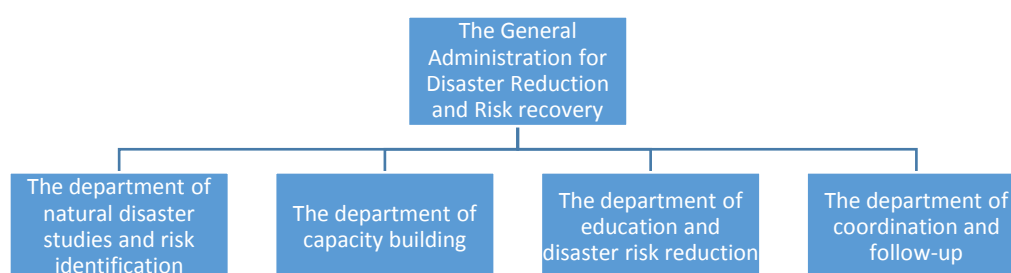
weather related disasters, while the majority of participants in Makkah Province and the Eastern Province were fairly worried. Finally, the majority of participants from Riyadh Province and the Eastern Province did not know whether their areas might be affected by weather-related disasters, while the majority of participants from Makkah Province and the Northern Province thought that their areas might be affected.

6.3 Interview Results

The two interviews were with an official in the Saudi Civil Defence and the head of the General Administration for Disaster Reduction and Risk Recovery in the Presidency of Meteorology and Environment. The focus of discussion with the two officials was on the situation of natural disasters in the kingdom and the role of these two organizations in disaster risk reduction.

One interviewee said that before the establishment of the general administration for disaster reduction and risk recovery, there was no one unified party to work at the national level; work was mainly at the regional and international level, rather the local level. The administration was set up in 2012. The administration has four departments, as is shown in Figure 6.14.

Figure 6.14: An outline of the general administration for disaster reduction and risk recovery in Saudi Arabia



According to the discussion in the interviews, the general tasks of the general administration for disaster reduction and risk recovery are:

- Develop policies for disaster risk reduction
- Support national research and develop its outcomes
- Apply disaster risk reduction programs to reduce disasters

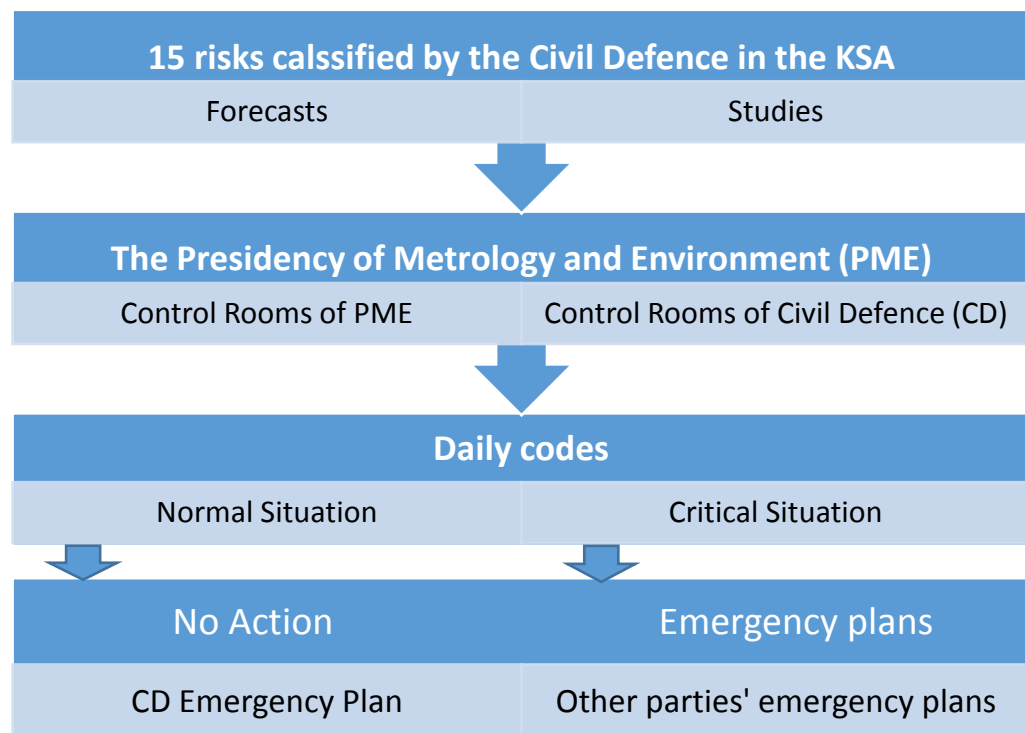
- Keep up-to-date with any development in the national, regional and international fields.
- Suggest training programs at the kingdom level for disaster risk reduction
- Develop the application of education programs
- Print out some instructions and information to support training, learning and education.

The administration has three main objectives:

- Decide the types of natural disasters in the kingdom and disasters that might result from climate change.
- Educate people and establish national cadres.
- Incorporate disaster risk reduction into strategic planning.

The work of the Saudi Civil Defence and the General Administration for Disaster Reduction and Risk Recovery in the Presidency of Meteorology and Environment to face disasters is summarized in Figure 6.15.

Figure 6.15: Response to disasters in Saudi Arabia (Source: Author)

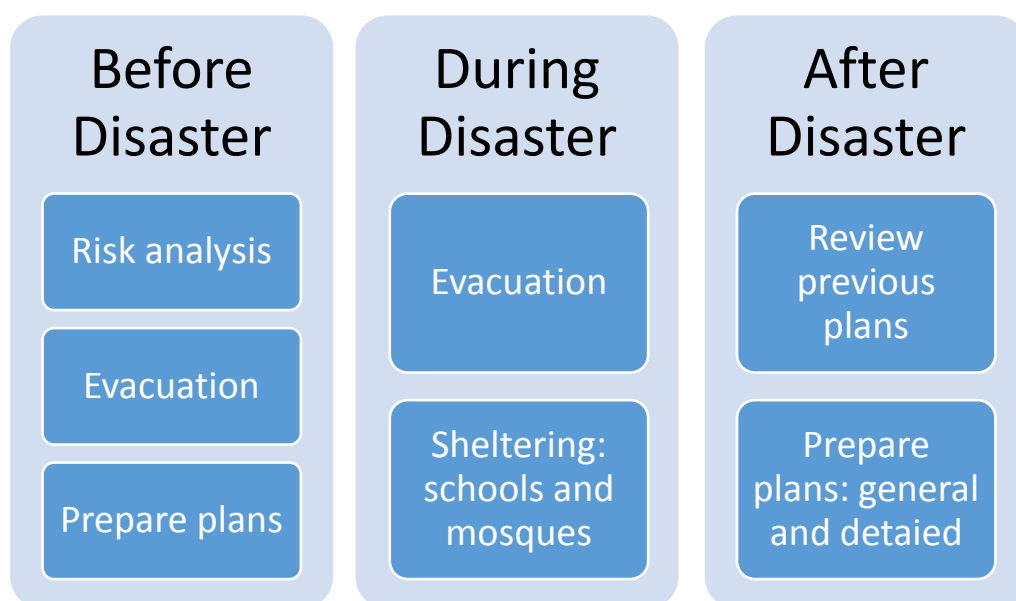


As is shown in the figure, the Saudi Civil Defence classified 15 risks in the kingdom, and this classification depended on previous studies and forecasts provided by the Presidency of

Metrology and Environment and the other involved parties in the kingdom. The fifteen risks are: fire breakout, floods, violent earthquakes, volcanoes, hurricanes, landslide, interruption of public services, wars, chemical or biological leak, severe lack of food and nutritional products, destruction of infrastructure, economic instability, terrorist actions, migration and displacement, epidemic and plane fall. If there is any expected risk, the Presidency of Metrology and Environment reports it to the Civil Defence who has control rooms with 24/7 cooperation with the control rooms in the Presidency of Metrology and Environment. The civil defence has different daily codes with different degrees of risk. If the code is normal, no action will be taken by the civil defence. However, if the code is critical, serious actions are taken and the civil defence starts to apply their emergency plan. In addition, other involved parties, such as Ministry of Health, start to apply their emergency plans.

Different actions are taken before the disaster, during the disaster and after the disaster, as is shown in Figure 6.16.

Figure 6.16: Actions taken to face disasters in Saudi Arabia (Source: author)



As is shown in Figure 6.16, before a disaster involved parties analyse risk to know vulnerability and prepare their plans to face any possible risk. They also evacuate vulnerable people who live in vulnerable areas such as valleys and near to the sea. During disasters, the main focus is on evacuation and sheltering. People are evacuated from the affected area and they are sheltered

either in schools or in mosques, which will be prepared for this purpose. After the disaster, previous emergency plans are reviewed to check their effectiveness and weaknesses, and new detailed plans are prepared in the light of the acquired experience.

The first Arab meeting to discuss natural disasters and the protection of the environment was in Aqaba in Jordan in 2012. In 2014, the second Arab meeting was held in Sharm el-Sheikh in Egypt. The outcomes of Arabs' meetings and the meetings of the other five regions were put together in one thing called 'Zero Draft. The Kingdom of Saudi Arabia has also cooperated with the international community with regards to Hyogo Framework. Working within Hyogo Framework required the establishment of a National Forum, which coordinates everything related to natural disasters, such as earthquakes and volcanoes, with Hyogo Framework. The Kingdom of Saudi Arabia has recently participated in the discussions of Sendai 2015 conference.

During the two interviews, the following was suggested to develop disaster risk reduction:

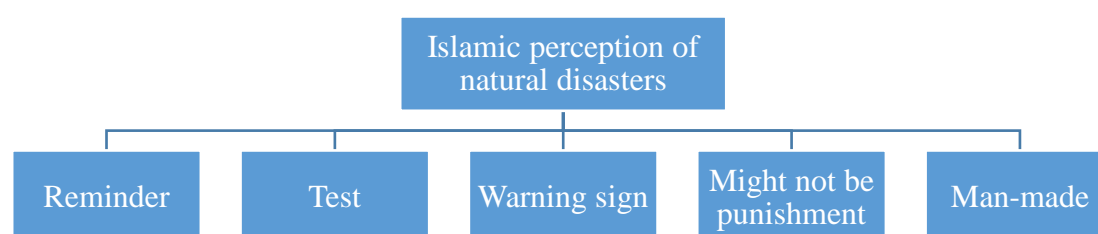
- Civil defence is a small administration to face aggressive disasters
- There should be better planning.
- There should be bigger effect for civil defence to spread knowledge and educate people.
- There must be a unified system which controls the system between different parties and the work for disaster risk reduction.
- There should be consultation with the administration of disaster reduction and risk recovery, and the basic strategic plans of the kingdom should be applied.
- People's knowledge about disasters is still weak so we need to increase our studies.
- There should be rules and regulations which protect people from these hazards.

6.4 Focus Group Results

The focus group interview was with seven scholars at the Islamic University in Al-Madinah Al-Munawarah. The results of the interview can be divided into Islamic perception of natural disasters and actions before, during and after the disaster. This section presents a summary of these results.

The Islamic scholars in the focus group made it clear from the very beginning of the discussion that the main principle in Islam is that everything happens in this universe as destined and measured by God. According to the discussion in the focus-group, Figure 6.17 summarizes how disasters are perceived from an Islamic perspective.

Figure 6.17: Islamic perception of natural disasters (Source: author)



As is shown in Figure 6.17 and discussed in Section 3.4.1, the Islamic scholars in the focus group explained that Islam considers disasters as a reminder from God to believers of His great creation and the ability to change everything on this earth. God says in the Holy Quran:

“We will show them Our signs in the horizons and within themselves until it becomes clear to them that it is the truth.” (41:53)

Disasters are also seen by the Islamic scholars in the focus group as a test from God to believers. The true belief and obedience of believers to God is tested by natural disasters to see how believers behave at the time of calamity. If such true believers show obedience to God and they keep worshiping Him at the time of calamity, God, as is mentioned in the Holy Quran and the Hadiths of Prophet Mohammad (Peace be upon him), will reward them.

Natural disasters were also seen by the Islamic scholars in the focus group as a warning sign from God to believers who commit sins and have many bad deeds. In this case, disasters scare people and tell them to go back to God and worship Him. God says in the Holy Quran:

“So their Lord brought down upon them destruction for their sin and made it equal [upon all of them]” (91: 14)

However, natural disasters, according to the discussion of the Islamic scholars in the focus group, are not necessarily a punishment from God to believers or non-believers because many stories in Islam reported disasters which happened to true believers. In this case, disasters are seen as a reminder from God more than a divine punishment to sinful people.

The Islamic scholars in the focus group argued that disasters are also seen in Islam as an outcome of the deeds of man who neglects the environment and spoil the earth. God says in the Holy Quran:

“Corruption has appeared throughout the land and sea by [reason of] what the hands of people have earned.” (30: 41)

Hence, according to the discussion of the focus group, natural disasters are seen in Islam as a reminder of God’s great creation and abilities, a warning sign or anger sign to sinful people and a result of man’s negative intervention in nature. Importantly, natural disasters, as is discussed by the Islamic scholars in the focus group, are necessarily seen as divine inevitable punishment from God to sinful people. Such discussion and results also indicate that there is no support for the extreme version of the fatalistic view of natural disasters as a divine inevitable punishment from God to sinful people.

In response to disasters, Islamic scholars in the focus group explained that many actions and protective procedures were reported in Islam before, during and after disasters. Table 6.1 summarizes the actions mentioned by the scholars in the focus group.

Table 6.7: Some actions before, during and after a disaster applied in Islam. (Source: Author)

Before Disaster	During Disaster	After Disaster
<ul style="list-style-type: none">- Be good with the environment- Be good with other creatures.- No sleeping in valleys.- No sleeping on fenceless roofs.- Close doors before sleeping- Cover food- Remove harmful things from the road.- Do not dig the road- Prepare to face disasters	<ul style="list-style-type: none">- Pray to Allah- Make dua'a (supplication)- Be patient- Answer the seeker's request- None goes into or out of a place affected with plague.- Do not mix sick animals.- Do not walk alone.- Prohibited to keep meat for more than three days.	<ul style="list-style-type: none">- Pray to Allah- Make dua'a (supplication)- Donate generously- Cooperation

Before disasters and at any time, Islam encourages people to be good with the environment and protect it. Messenger Mohammad (Peace be upon him) said "If the Hour (the day of Resurrection) is about to be established and one of you was holding a palm shoot, let him take advantage of even one second before the Hour is established to plant it." Islam also encourages people to be good with other creatures "A reward is given in connection with every living creature." As is shown in the Table 6.7 and according to the focus group discussion, there are many protective procedures that messenger Mohammad (Peace be upon him) ordered his companions and all Muslims to follow and apply in their daily life. The messenger ordered people not sleep in valleys to protect people from the destructive effects of floods. Similarly, it is not allowed for people to sleep on fenceless roofs because they might walk while they are sleeping, fall down and die. People should also close the doors of their houses when they sleep to protect themselves from robbery. Also, people should not dig the road and remove harmful things from the road to avoid any problems to pedestrians and cars. Finally, Islam asked people to prepare to face disasters and reduce their effects. For example, Omar Bin Al-Khattab (May Allah forgive his sins) used to send scholars to the different regions to prepare for winter. Omar used to say "You have a fast entering enemy, but very difficult to leave," so he ordered people to be prepared to face it.

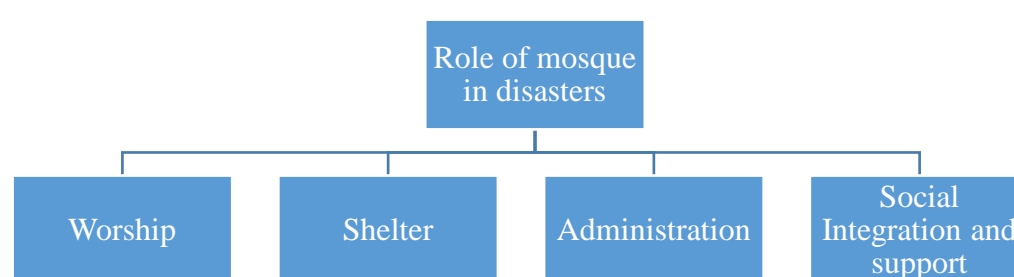
During disasters, the Islamic scholars in the focus group explained that Islam advised people to follow certain actions and procedures to reduce the effects of natural disasters. First, Muslims should pray to God, make dua'a (supplication) and ask for forgiveness from God. Messenger (Peace be upon him) said "These signs which Allah sends do not occur because of the life or death of somebody, but Allah makes His worshipers afraid by them. So when you see anything thereof, proceed to remember Allah, invoke Him and ask for His forgiveness." They should also be patient during disasters to endure the risks and answer the needs of any seeker who asks for help and support. In certain occasions when disasters occurred during the time of Messenger Mohammad (Peace be upon him) and his companions, they ordered people to follow certain procedures. For example, it was reported that when there was plague in Damascus, Omar Bin Al-Khatib ordered that none of Damascus residents goes out and none goes into Damascus. That is because Messenger Mohammad (Peace be upon him) said, "If it (plague) be in a country where you are staying, do not go out fleeing it, and if you hear it is in a country, do not enter it." Similarly, Islam ordered people not to mix sick animals with healthy ones to avoid any infections. Mohammad (Peace be upon him) said "Do not mix the sick camel with a healthy camel." At the time when there was violence and unrest, people were not allowed to walk alone to avoid problems. In this regard, messenger Mohammad (peace be upon him) said "A single rider is (accompanied with) Satan and two riders are (accompanied with) two Satans. Three riders form a group." In that year when people ate animals' leather because of hunger, it was not allowed to keep the meat of scapegoats for more than three days because of severe hunger. It is mentioned in the Holy Quran "Or the giving of food in a day of privation." It means if a famine happens, Islam encourages Muslims to feed "To the orphan with claims of relationship, Or to the indigent (down) in the dust."

After disasters, Islamic scholars in the focus group pointed out that Islam ordered people to follow certain actions to reduce the effects of disasters. That is, people should pray to God (May He be glorified and exalted), make dua'a (supplication) and ask for forgiveness from God. Muslims should also donate generously to help people who were affected by disasters. Importantly, Islam stresses on social integration and cooperation to reduce the effects of disasters. Messenger (Peace be upon him) said "The believers in their mutual kindness, compassion and sympathy are just like one body. When one of the limbs suffers, the whole

body responds to it with wakefulness and fever." Therefore, Islam encourages people to help each other in the time of calamity.

As for mosque, the Islamic scholars in the focus group said that it has a central role in Islam when disasters happen. Their discussion focused on the following roles of mosque in the life of Muslims, in general, and in natural disasters, in particular:

Figure 6.18: The role of mosque in Islam (Source: author)



In the daily life of Muslims and in the time of disasters, as is shown in Figure 6.18, a mosque is visited by people to pray to God, make dua'a (supplication) and ask for forgiveness. It is also used as shelter where people can escape from a disaster and stay there. As is mentioned in Section 3.4.3, the mosque usually occupies a central position in any residential gathering for Muslims, so it will be easy for people around to access it quickly. The best place in the world for Muslims to feel safe and secure is the mosque because they usually feel that they are under the protection and mercy of God. That is because the mosque is considered the house of God in Islam. At the time of messenger Mohammad (Peace be upon him), some very hungry people, who used to eat animals' leather, came to the mosque and met the messenger who asked people to give them charity. People started to give them some dates and the messenger said "Whosoever sets a good trend in Islam, for him is its reward and the reward of those who act by it."

The Islamic scholars in the focus group also said that the mosque has an administrative role because a mosque used to have consultation council in the reign of Omar Bin Al-Khattab (May Allah be pleased with him). There was no place for the government to meet in except the

mosque. The Islamic scholars in the focus group explained that the mosque used to look after the daily life issues of Muslims and very important administrative issues and decisions were taken inside the mosque. When Prophet Mohammad (Peace be upon him) or the Khalifa after him wanted to discuss any administrative issue, they used to call people to gather in the mosque and discuss the issue. When a disaster happens, people hurry to the mosque to know about the disaster and cooperate with each other.

In addition to being a place for worship, a shelter and an administrative council, the Islamic scholars in the focus group explained that the mosque was an important centre for social integration and support. Actually, this role for the mosque is still active today. People go to the mosque five times a day for prayers and meet there. They socialize and discuss any issues or problems they have. If anyone complains about a problem, all the other brother hurry to help and support him. Also, anyone local resident or foreigner needs help or support, their first resort will be the mosque. The mosque usually holds social activities to strengthen the social integration of the community and spread the message of peace.

Finally, the Islamic scholars in the focus group said that climate change and the increase of disasters are predicted by Islam, which says that the earth will go back to the original status of creation. They discussed the evidence mentioned in the Holy Quran and the Hadiths of Prophet Mohammad (Peace be upon him) that at the end of life on this universe God will restore the earth back to the status when it was first created by Him. Therefore, many natural disasters will occur to participate in the process of returning the earth back to its original status of creation. Importantly, this process of restoration will be gradual.

6.5 Summary

This chapter presented the results of the research methods used in the study, namely the questionnaire, interviews and the focus group interview.

The questionnaire results were presented as overall results, results by gender and results by province. The questionnaire results showed that conflicts, earthquakes and floods were considered by the majority of participants as the most likely disasters in the Kingdom of Saudi Arabia.

The perception of hazards by Saudi people, according to the results of this chapter, can be looked at from two perspectives. From a DRR point of view, the Saudi people do not know much information about natural disasters in their country. Therefore, they do not know which natural disasters might affect their areas and why such disasters might occur. From a faith point of view, the Saudi people believe in the religious interpretation of disasters as a test or a warning sign from God. In other words, natural disasters are seen as a test of the belief of a true Muslim or as a warning of the negative intervention of man in nature. However, the Saudi people do not believe in the extreme version of the fatalistic view of natural disasters. Therefore, the Saudi people do not look at natural disasters as a punishment to sinful people. Instead, they considered early warning systems, disaster management and risk awareness as the most important factors in effective disaster risk reduction.

Media, the government and the internet were chosen by the majority of participants as the most important means of knowledge about natural disasters and how to face them. As for the seriousness of the impacts of natural disasters, environmental and human impacts were the most important ones, as was chosen by the majority of participants.

When it comes to preparation to face the risks of natural disasters, the results of this study showed that Saudi people are not well-prepared or not prepared at all. They had not had any previous training before on disaster risk reduction. However, the majority of participants thought that people in the Kingdom of Saudi Arabia can help to reduce the risks of natural disasters in the kingdom, and the majority of participants were enthusiastic to take part in any training or efforts in disaster risk reduction. The mosque was seen by the majority of participants as a good place to educate people about natural disasters and how to face them effectively.

Results by gender were surprisingly identical to overall results and there was no important difference between male and female participants' responses on the majority of responses. This significant finding will be accounted to in the discussion chapter. However, results by province showed differences between the responses of the four provinces.

Interviews with the Islamic scholars in the focus group confirmed the results of the questionnaire. That is natural disasters are seen as a test or a warning sign from God more than a divine punishment, which contradicts the extreme version of the fatalistic view of natural disasters. The Islamic scholars in the focus group also explained that the mosque has a central role in the life of Muslims in everyday activities and during natural disasters. The mosque is a place for worship in the daily life of Muslims and a place for praying and making dua'a (supplication) during disasters. The mosque also occupies a strategic position in any residential gathering of Muslims, which makes it easy to access as a place of shelter. In addition, the mosque is seen as a very important place to maintain the social integration of the community, provide assistance, and support people in need.

Chapter Seven: Discussion

7.1 Introduction

This thesis, as was mentioned in Chapter One, aims to evaluate current approaches to disaster risk reduction in the Kingdom of Saudi Arabia and examine the actual and potential role of Islamic teaching in the perception and reduction of the risks of natural disasters. Previous chapters discussed in details the various Islamic views on natural disasters and the role of Islamic teachings in disaster risk reductions. Methodological issues, approaches, data collection and results were also discussed.

This chapter discusses the results obtained in the study in the light of previous studies on the role of Islam in natural disaster risk reduction. It shows that the majority of participants in this study lack much information and training about natural disaster risk reduction. They also did not know whether their provinces might be affected by natural disasters, so they were not very worried. However, they were enthusiastic to be active in any efforts to mitigate the risks of natural disasters in the Kingdom of Saudi Arabia. Discussion of the results of this study shows that Islam encourages people to be active in natural disaster risk reduction. In this regard, the mosque can have a very important role in natural disaster risks reduction. An integration of the Islamic teachings into the policy of natural disaster risk reduction in the Kingdom of Saudi Arabia is proposed at the end of the chapter.

7.2 Disaster Perception and Preparedness of People in Saudi Arabia

The results of this study show that the majority of participants considered conflicts, earthquakes and floods as the most important disasters that might take place in the country. These disasters, especially conflicts and floods, have been the main concern of people in the region. It is very clear that instability in the Arab World affected the opinion of the participants in this study. Saudi people are worried about the instability in the Arab World, in particular in Libya, Syria, Iraq and Yemen. The country has also witnessed many floods lately, which has raised many concerns at the individual and governmental levels.

However, the results of this study show that the majority of participants in this study lack knowledge about the probability of natural disasters in their country. Similar to the results of Alshehri et al (2013) and Azim and Islam (2016), the majority of participants in this study did not know whether natural disasters might hit their provinces, and what kind of natural disasters might affect their provinces. Because of lack of knowledge, people were naturally not worried about their lives and the lives of their families. The results of this study show the participants had not received any training or information about disasters in their provinces and how to behave if a disaster takes place. This negative situation is surprising, especially if we compare it with their opinions about the environmental, human and economic impacts of disasters on their country. Therefore, the reaction of people and the government in this study was found to be reactive rather than proactive. Such results support the findings of Abosuliman et al. (2013) who found that Saudi people are aware of the impacts of natural disasters, but they lack training and awareness in responding to natural disasters. Similarly, the results of this study agree with Alamri (2011), Al-Qahtani (2014), Azim and Islam (2016) and Rahman et al (2016) who found that Saudi people are reactive in response to natural disasters, and they lack information and preparation to face natural disasters.

Despite of the pessimistic situation about the perception of natural disasters by the participants in this study, the majority of them, similar to the findings of Alshehri et al (2013), were enthusiastic to take any part and receive training to face the risks of natural disasters in their provinces. The majority of participants in this study, similar to the results of Azim and Islam (2016), strongly believed that they could help to reduce the destructive effects of natural disasters. The majority of participants in this study considered early warning systems and media as important factors to reduce the negative effects of natural disasters.

The responses of participants in this study, similar to the results of Azim and Islam (2016), were expected to vary by gender differences, with males showing better knowledge and preparedness than Saudi females. This variation was expected because of the different social and traditional factors in the Kingdom of Saudi Arabia, as was shown in Section (4.2.2). However, the perception of natural disasters by Saudi people was not affected by gender differences in this study. The responses of male and female participants were usually identical in most of the cases with regards to possible disasters, impacts, training received and sources

of knowledge about disasters. Such results challenge the common view that Saudi women are less educated than Saudi men because of the segregation between the two in all aspects of life and the less socializing opportunities for women. In fact, the governmental efforts in providing education to all and the availability of modern technology to women have played a role in reducing the education variation between males and females in the Kingdom of Saudi Arabia. It is very important to mention here that all the female and male participants in this study were educated, so it is possible that gender differences were nearly absent in this study due to the effect of education. Another interpretation to these unexpected results can be ascribed to the sources of knowledge and perception. Knowledge is normally derived from education while perception comes from religion. Since both male and female participants were Muslims, there were no big differences in their perception of natural disasters.

However, participants' responses sometimes varied according to the province. For example, the majority of participants in this study from Riyadh Province and Makkah Province were not sure that they could minimize the effects of natural disasters, while the majority of participants from the Northern Province and the Eastern Province were confident that they could help to reduce the negative effects of disasters. These differences can be ascribed to the fact that Makkah Province and Riyadh Province have witnessed violent natural disasters, especially floods, in the last decades, which left devastative human and economic impacts on the people in the two provinces, as is shown in Section 4.2.4.1. Natural disasters in the Northern Province and the Eastern Province, in contrast, were less frequent. Results also showed that the majority of participant from Riyadh Province and the Northern Province were not very worried about natural disasters, but the majority of participants from Makkah Province and the Eastern Province were fairly worried. This difference was expected because Makkah Province and the Eastern Province are located along the coastal areas in the kingdom. Makkah Province looks on the Red Sea, while the Eastern Province looks on the Arabian Gulf, as is shown on the map in Figure 4.1. Therefore, participants from these provinces are expected to be worried about natural disasters, especially floods.

Overall, this study shows that the Saudi people are enthusiastic to reduce the effects of natural disasters and take part in mitigating the risks of natural disasters in the Kingdom of Saudi Arabia. However, the majority of participants in this study seemed to lack knowledge about

the risks of natural disasters in terms of the probability of natural disasters in their provinces and how to face them.

Hence, both the Saudi government and people, according to the results of this study, are reactive rather than proactive in natural disaster risk reduction because people did not have much information in advance about disaster risk reduction. If people in the Kingdom of Saudi Arabia have enough information and training on disaster risk reduction, they will be able to apply protective procedures related to disasters in their provinces and mitigate the risks of natural disasters. It is the responsibility of the involved parties in the Kingdom of Saudi Arabia to adopt effective policies in disaster risk reduction, and these policies should educate people on the possible natural disasters in their provinces and train them on how to mitigate the risks of natural disasters.

7.3 Islamic Teachings and Disaster Risk Reduction

The relationship between the fatalistic view and DRR is very important in this study. If Muslims believe in the fatalistic view of natural disasters, they will be passive to the scientific procedures of DRR, or even they will consider such procedures as forbidden in Islam because they are a challenge to the God's will. Moreover, belief in the fatalistic view of natural disasters means that Muslims are not proactive in DRR. Instead, they will surrender to their inevitable destiny. However, this research finds that most of the participants did not support the extreme version of the fatalistic view. This shows that Islam is proactive in DRR.

The results of this study show that the majority of the participants in this study believed that natural disasters are a test, a reminder or a warning sign from God more than being an inevitable divine punishment from God, which contradicts the fatalistic view of natural disasters. In the extreme version of the fatalistic view, natural disasters are considered an inevitable divine punishment by God, and this predestined punishment cannot be changed or mitigated by people who should surrender to the divine punishment and go back to the teachings of their creator. Such a view, as was shown in Section 3.5, was supported by many studies (Alshehri, 2015; Kasapoğlu and Ecevit, 2003; Paradises, 2005) where the majority of participants in these studies attributed natural disasters to the will and knowledge of God. However, about 40 percent of the participants in this study did not neglect the other options, which ascribe natural

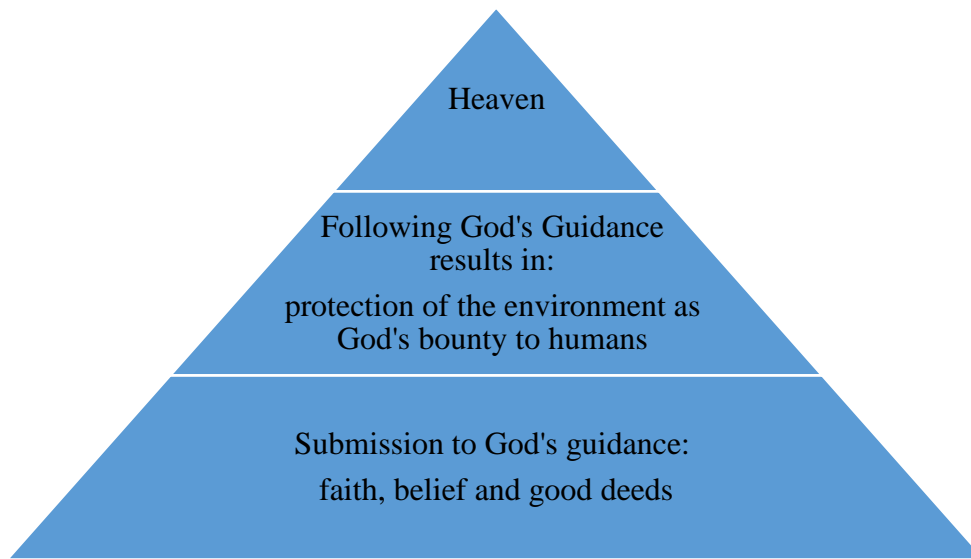
disasters to natural processes or man's disregard of nature. This opinion is very important because it shows that natural disasters might not be completely ascribed to God's anger or punishment, but there can be negative human intervention and natural processes behind them. In addition, the majority of participants in this study mostly agreed that they could help to minimize the effects of natural disasters in their provinces, which indicates that the extreme version of the fatalistic view of natural disasters, similar to the results of Azim and Islam (2016), is not completely supported in this study. In other words, the participants in this study acknowledge that natural disasters are caused by God, but these disasters are a result of negative human intervention in nature, as is mentioned before in Section (3.4.1.1) and repeated here for convenience:

“Corruption has appeared on earth and at sea because of what the hands of men have wrought; in order that God may make them taste the consequences of their actions; so that they might return” (30:41).

The discussion with the Islamic scholars in the focus group showed that natural disasters might be a warning sign from God, a test or a reminder from God to man, but it is less likely to be a punishment. When we say natural disasters might be a reminder or warning sign, there are two possible interpretations. The first interpretation agrees with the fatalistic view that disasters are warning or reminder from God to sinful people to repent and go back to the right road prescribed by God. The second interpretation considers natural disasters as a reminder or warning sign that there is a serious change in the universal balance created by God. Therefore, some less violent disasters might occur to direct people's attention to the risk of their negative intervention in the universal balance. In fact, the second interpretation is supported by the discussion of the Islamic scholars in the focus group who said that disasters can be a result of our actions as humans. Such a view agrees with White (1945) who argues that floods are acts of God, but the losses and impacts of floods are caused by human intervention.

The Islamic scholars in the focus group also showed that the protection of the environment and risk reduction are of the core good deeds in Islam. The discussion of scholars in the focus group in this regard is summarized in Figure 7.1.

Figure 7.1: Path to heaven through environment protection (Source: author)



According to Figure 7.1, the ultimate aim for any Muslim is God's Heaven after the resurrection. To reach the promised Heaven, a Muslim should show submission to God's guidance, which includes to have faith in God as your creator, believe in the message of His messengers and do good deeds to be rewarded on the day of judgment. Since this universe and all the creatures on it are blessings and bounties to man by God, man is asked by God to preserve and protect the earth because God made man His steward on the earth. Doing good deeds includes the protection of everything on this earth, as is shown in the following verse from the Holy Quran:

'And do good as Allah has been good to you. Moreover, do not seek to cause corruption in the earth. Allah does not love the corrupters' (Al- Qasas: 77).

Therefore, one requirement of the good deeds is to protect the earth and its creatures to please God and go to Heaven. Hence, protecting nature and reducing the risks that might harm people and other creatures of God are required by Islam to be a true believer.

The claim that natural disasters can be seen as mere punishment from God to sinful people is not fully supported in this study. Kasapoğlu and Ecevit (2003) and Paradise (2005) reported

that their participants, especially the low-educated ones, thought that natural disasters are punishment to sinful people and only true believers will be saved from this punishment. However, discussion with the Islamic scholars in the focus group in this study (see Section 6.4) showed that this claim is questionable because there are many stories reported in the Holy Quran and hadith that sinful people and pious believers were all affected by natural disasters. For example, in one of the hadiths, it is reported that “I said, ‘O Messenger of Allah! Shall we perish while still there will be righteous people among us?’” He (Peace be upon him) replied, ‘Yes, when wickedness prevails’.” As can be seen from this hadith, punishment will be upon all alike and no one will be saved. This idea is also expressed by the Prophet Mohammad (Peace be upon him) in the following hadith:

Nu`man bin Bashir (May Allah be pleased with him) reported: The Prophet (PBUH) said, "The likeness of the man who observes the limits prescribed by Allah and that of the man who transgresses them is like the people who get on board a ship after casting lots. Some of them are in its lower deck and some of them in its upper (deck). Those who are in its lower (deck), when they require water, go to the occupants of the upper deck, and say to them: 'If we make a hole in the bottom of the ship, we shall not harm you.' If they (the occupants of the upper deck) leave them to carry out their design they all will be drowned. But if they do not let them go ahead (with their plan), all of them will remain safe".

This important hadith focuses on two important points related to disaster risk reduction. The first point, which contradicts with extreme version of the fatalistic view of natural disasters as punishment to sinful people, is that all people, believers and non-believers will suffer alike from natural disasters. Therefore, it is not true that true believers will be saved and only sinful people will be punished. It is the responsibility of true believers to direct and advise the non-believers to be saved. In natural disasters context, if some people spoil the divine universal balance created by God while others keep watching and do nothing, all people will suffer. Hence, all people should obey the procedures and policies of disaster risk reduction. Second, this important hadith focuses on the idea of mitigation of risks to be saved. If the people in the upper deck allowed people in lower deck to do whatever they want, all people on the ship will suffer. Therefore, mitigation of the risks of natural disasters should be applied by all parties to reduce the risks of natural disasters.

The low-educated participants in Kasapoğlu and Ecevit (2003), Paradise (2005) and Adiyoso and Kanegae (2015) considered natural disasters as a kind of punishment to sinful people. In

fact, the poor education system, which is triggered by the extreme version of the fatalistic view, in the Islamic countries has contributed to the suffering of people because of the absence of mitigation porcedures against natural disasters (Ghafory-Ashtiany, 2009). In addition to the poor education system, many other factors escalated the suffering of people because of disasters, as is stated by Baytiyeh and Naja (2014: 346-347):

The situation in the Middle East is similar to that in many economically less countries, where exhaustive wars, sectarian conflicts, political neglect, poor educational opportunities, unstable economies and low quality of life drive people to take risks without taking precautionary measures. These conditions encourage the spread of fatalistic beliefs among individuals, especially after tragedies and crises. Such views can provide relief to victims since they conveniently refer to the will of God as an escape from blaming themselves and the authorities for the neglect and unpreparedness that led to their hardship and tragedy.

However, the participants in this study, who were all educated, did not reject the fact that natural disasters are natural processes which result from human intervention and violation of the universal balance created by God.

Based on these quotations and the discussion with the scholars in the focus group, it can be said that the meaning of natural disasters as punishment, which is usually reported by Muslims, is not punishment to sinful people, but it is punishment because people, righteous and sinful, violated the balance that is created by God in this universe. Although the participants said that natural disasters might be punishment or anger sign from God, they still believe that they can help to implement the policies and strategies of disaster risk reduction. This contradiction between the fatalistic view and the readiness to be prepared to face natural disasters is not strange in Islam. For example, Anas ibn Malik reported that a man said, “O Messenger of Allah, should I tie my camel and trust in Allah, or should I untie her and trust in Allah?” The Messenger (Peace be upon him) said, “**Tie her and trust in Allah.**” The intended meaning in this hadith is that you should trust in God, but at the same time you should care about worldly matters and reasons. Applying this Hadith to natural disasters, a Muslim trusts in God and knows that whatever causes disasters, natural reasons or man-made, they are caused by God who is the creator of this universe. Even disasters are caused by God, Muslims should take regard of the worldly reasons that cause natural disasters and a Muslim should consider the possible ways to face the risks of natural disasters. Chester and Duncan (2009), as was shown in Section 3.4.2, also proposed the parallel practice concept where religious people believe in

the fatalistic view of natural disasters, but they still do not reject the policies or strategies of disaster risk reduction. Chester et al. (2013), who conducted a study on the perception and preparedness to face the risks of earthquakes in the United Arab Emirates, found that this was the case for Muslims in the UAE. Hence, this is the likely interpretation of the results in this study. People in Saudi Arabia has strong belief in the religious interpretation of natural disasters, but they do not reject volunteering and helping in the policies and strategies of disaster risk reduction in the Kingdom of Saudi Arabia.

Although the mosque has special importance in the Saudi society, which is a religious society that keeps five prayers a day at the mosque, it does not have an important role as a source of information about disasters, compared with social media and TV. However, many participants in this study thought that a mosque can have an important role in reducing the destructive impacts of natural disasters. In particular, participants in this study thought that a mosque can be important in educating people about natural disasters, providing training and a place of shelter.

The results of the scholars in the focus group showed that the mosque had a very central role in the past, at the time of Prophet Mohammad (Peace be upon him), when there was no government, but Muslims used to gather in the mosque to decide very important issues related to people's life, such as peace and war. However, according to the opinions of the scholars in the focus group, the mosque is reactive rather than proactive at the time of disasters nowadays. When a disaster takes place, people rush to the mosque seeking for a shelter. Before disasters, people do not receive any training or education in the mosque about disaster risk reduction. In fact, it is strange how a mosque in Saudi Arabia has only a reactive role although the majority of participants in the questionnaire and the scholars in the focus group said that a mosque can provide social integration, training and education about disasters and how to deal with them, which means that the mosque should have a proactive role. The mosque in Saudi Arabia can have a proactive role if the Masjid Tannguh, which is suggested by Saputra et al. (2014) and mentioned above in Section 3.4.3, is applied by the government, faith leaders and other different parties in the Kingdom of Saudi Arabia. That is, the government should assess the local areas in terms of demography, topology, mosque services and possible risks. Curriculum designers should design modules that address potential disasters in the area and recommend

protective procedures. Volunteers and agents, especially youth, should also be recruited by the government and faith leaders to socialize awareness of natural disasters in the area and direct people on who to protect themselves.

The mosque should also have the roles suggested by Cheema (2012) and mentioned above in Table 3.3 to be proactive in disaster risk reduction. Cheema says that the mosque can have many important roles in disaster risk reduction, such as educational roles, health unit and fund distribution centre, communication and advocacy role, information and communication centre, psychological and spiritual role and other development functions. The mosque should also be a very active local centre in disaster risk reduction, as suggested by Harun-ur-Rashid (2004) and Intan et al. (2015). These researchers, as was shown in Section 3.4.3, argue that policies and strategies are decided at the highest level, but their implementation should be discussed at the local level in the community, especially in the mosque.

Teachings of Islam show a proactive policy in disaster risk reduction. Different from the opinions of participants in Kasapoğlu and Ecevit (2003), Paradise (2005), Alshehri (2015) and Adiyoso and Kanegae (2015), who said that Muslims should not take proactive actions against disasters because such disasters are punishment from God and man can do nothing to stop them. The Islamic scholars in this study explained a proactive policy that shows what actions to take before, during and after disasters. Before disasters, Islam encourages people to take protective procedures, such as being good with the environment and all the creatures around them. Islam also encourages Muslims to be prepared and trained to face disasters. During disasters, as is shown in the scholars' comments in Section 6.4, Islam encourages people to pray to God and make dua'a (supplication), volunteer to help the affected people, answer the seeker's request and do not go into affected areas, such as plague, because you might get infected. After disasters, Islam encourages people to pray to God and thank Him for saving them from disasters, donate generously and cooperate between each other to face disasters in the future.

Based on what has been discussed above, it can be argued that an extreme fatalistic view of natural disasters, where natural disasters are seen as a divine inevitable punishment to sinful

people who can do nothing to change their destiny, is not fully supported in Islam. A parallel practice works out in the Kingdom of Saudi Arabia. Muslims strongly believe that everything happens in this universe is caused by the will of God, but this does not mean that Muslims should not look at the reasons behind the problem. If a disaster takes place, it does not necessarily mean that God wants to punish us because we have been sinful, but natural disasters can be seen as a punishment for man's negative intervention in the universal balance created by God. Islam does not say you can live in the plain of a river and rely on God because your destiny is in His hands, even if you were the best pious believer on this earth. On the contrary, Islam forbids living in areas vulnerable to disasters because it is seen as a kind of suiciding, which is forbidden in Islam. To put it simply, Islam agrees with the famous quotation that floods are "acts of God, but flood losses are largely acts of man" (White, 1945: 2). Islamic teachings encourage people to be proactive rather than reactive in disaster risk reduction. That is, people should be prepared and take protective procedures for disaster risk reduction.

As was shown in this study, the mosque had a very central role in the life of Muslims in the past, and this active role should be activated to mitigate the risks of natural disasters. The strategic geographic position of the mosque and the high status of mosque in the life of every Muslim should be used to make the mosque an active local centre for disaster risk reduction. Muslims should be educated at the mosque about the possible natural disasters in their areas and how to face such potential disasters.

7.4 Disaster, Science and Islam

There is a misconception of a conflict between Islam and science, especially when it comes to the issue of natural disasters and their causes. For example, Chester (2005: 325) says, "Islam literally means submission and—as characterised by most western commentators—has a strongly instrumentalist view of suffering. God uses suffering to discipline human beings and bring them back to the Prophet's teaching."

However, the western view of the conflict between Islam and science is not true. The discussion of earthquakes, their causes and protective procedures by Muslim scholars in the 15th and 16th centuries shows that Muslims believe in logic and science because they never contradict with the teachings of the Holy Quran and Prophet Mohammad (Peace be upon him) (Gari, 2004).

As was shown in Section 3.6, the first revelation to Muslims by God was to read¹³ and learn. Islam made the status of scholars and people of knowledge equal to the status of God's messengers and prophets. That is because only these people of knowledge can correctly understand the signs of God and the meaning behind these signs. Most of the comments about the instrumentalist view of suffering in Islam were based on studies conducted on low-educated Muslims or some extremist Muslims. For example, the less educated participants in Paradise's (2005) study attributed natural disasters to the divine will, and they said most of the time "God Knows." However, when the Islamic scholars in the focus group in this study were asked about natural disasters and whether they can be punishment from God, they stressed on the common misconception about natural disasters as punishment from God. On the contrary, the Islamic scholars said that natural disasters might not be punishment, but a natural outcome of negative human intervention in the universal balance created by God. The majority of participants, who answered the questionnaire in this study, also believed that they could help to reduce the destructive effects of natural disasters. They said that early warning systems, risk awareness and disaster management can be effective in disaster risk reduction. If these participants, who were all Muslims, had had a strong belief in the fatalistic view about natural disasters, they would have been passive about the ability of people and science in disaster risk reduction. Instead, they would have said people cannot prevent or reduce the effects of natural disasters, but they have to pray to God and ask for forgiveness. However, their responses to the questionnaire questions indicate that they believed in science and the ability of humans to reduce the effects of natural disasters.

If disasters might not be punishment in Islam and we believe that there is no contradiction between Islam and science, what is the Islamic explanation of disasters? And is this explanation compatible with the scientific explanation? When a natural disaster takes place, it is because of a change in the natural universal balance. Similarly, the main principle in Islam is that God created everything in this universe in balance, as was mentioned in the Holy Quran in Section 3.4.1 and repeated here for convenience:

"Verily, all things have We created by measure" (54:49)
"And We have produced therein everything in balance." (55:7).

¹³ The meaning of verb "read" in Arabic refers to think and learn to acquire knowledge. For more details, see Footnote 3.

According to Islam, when man makes any critical change in this divine balance, disasters will take place, as was mentioned in the Holy Quran in Section 3.4.1.1 and repeated here for convenience:

“Corruption has appeared on earth and at sea because of what the hands of men have wrought; in order that God may make them taste the consequences of their actions; so that they might return” (30:41).

In this case, natural disasters are seen in Islam as a reaction to the wrong and corrupted actions of people, which is in accordance with the scientific explanation.

Even if the Islamic and scientific explanations of natural disasters do not agree with each other, the authority of one explanation over the other is questionable. Bagir (2012) argues that knowledge about natural disasters involve three main factors: science, religion of the community and the local culture of the community. Bagir (2012: 361) says:

Broadly speaking, science is a way to make sense of nature; scientific knowledge is grounded in the experience of nature. But it is not the only source and there are other ways of experiencing nature. In addition, one makes sense of nature by also drawing from religion—and other sources of meaning as well, such as local cultures or any other value system. In this framework, science, religion, local cultures, or any value-system that are effective for certain individuals or communities are put on a par as sources of meaning making.

As mentioned in Section 3.2, many of the local people in a Thai community were successfully survived the natural disaster during the Indian Ocean Tsunami in 2004 while many tourists and migrants were hugely affected because foreigners lack the local culture of the affected area. In this case, a cooperation rather than contradiction between the three factors is required for the effective management of natural disasters. Interestingly, this is the focus of this study, which concentrates on the Islamic perception of natural disasters and the role of Islamic teachings in disaster risk reduction in the Kingdom of Saudi Arabia. The majority of previous studies has focused on the scientific view of natural disasters and the role of science in disaster risk reduction. However, this study bridges the gap in literature and shows that religion can play an important role in disaster risk reduction.

The authority of religion in some societies, such as the Saudi society, is sometimes stronger than the authority of science. The authority of religion in this country is very strong and cannot be ridiculed. In such a scenario, a suggestion of two routes for cooperation between hazard analysts and faith leaders is suggested by Chester (2005). The first route is related to the religious leaders who can offer spiritual leadership and community support in the form of aid, while the second route is related to the development in theodicy “because models of theodicy are now more sophisticated than they were in the past that more fruitful dialogue may take place” (Chester, 2005: 325).

7.5 Hazards and Disasters in Islam

The wide spread view in the Western society is that there is contradiction between science and Islam concerning natural disasters. The majority of less educated Muslims and some extreme Muslim scholars also hold a fatalistic view about natural disasters. That is, natural disasters are used by God as a punishment instrument to bring sinful people back to the teachings of the Holy Quran and Prophet Mohammad (Peace be upon him). In contrast, great Muslim scholars in the 15th and 16th centuries proposed a logical and scientific explanation for natural disasters and recommended effective protective procedures (Gari, 2004). The majority of Muslim scholars in the focus group in this study and the high profile Islamic scholars in the Kingdom of Saudi Arabia also said natural disasters might not be punishment by God, but the acts of man.

The disparity between these views in Islam, in the researcher’s opinion, goes back to the difference between natural hazards and disasters. Blaikie et al. (1994: 21) differentiated between the two by saying, “A disaster occurs when a significant number of vulnerable people experience a hazard.” In this case, a natural hazard can stay a natural hazard without developing into a disaster if it does not cause overwhelming and destructive damage to animals, plants or man. The causes of natural hazards might be man (e.g., global warming) or natural (e.g., floods). Wisner et al. (2003) explain that some natural hazards, such as floods or volcanoes, can provide cheap good opportunities to man because flood plains can be useful cheap option for business and housing and volcano slopes are usually fertile. At the same time, there is a risk factor in these natural hazards and they develop into disasters if they cause destructive damage.

However, the above important distinction between natural hazards and disasters seems to be lacking in the Islamic discourse. When Muslims talk about hazards, as a punishment/test from God and this cannot be changed, it is not clear whether they talk about hazards or the disasters that result from the vulnerability of people. In the researcher's opinion, when Muslims talk about natural hazards/disasters as inevitable destiny caused by God, they mean natural hazards, not disasters. Importantly, this idea is largely true and supported by many of the well-known researchers in disaster management. For example, White (1945: 2) described floods as the "...acts of God, but flood losses are largely acts of man." This idea is clearly mentioned and supported in the Holy Quran in many occasions, as was discussed in detail in Section 3.4.1. The logic in Islam is that everything that happens in this universe is by the will of God. However, God says in the Holy Quran that He created everything in measure and balance.

"The sun and the moon follow a reckoning, / and the grass and the trees prostrate. / And He has raised the heaven and set up the balance, / [declaring] that you should not contravene with regard to the balance. / And observe the measure with justice and do not skimp the balance. / And the earth, He placed it for [all] creatures." (55:5-10).

Importantly, this divine balance and measure does not change in random or for illogical reasons. For example, when the son of Prophet Mohammad (Peace be upon him) died, there was an eclipse and people started to say the eclipse was because of the death of the prophet's son. The prophet refuted that and said, "O people! Indeed the people in the times of ignorance used to say: 'Verily the sun and the moon are not eclipsed except due to the death of a great person.' But rather they are two great signs from the signs of Allah, they are not eclipsed due to the death of anyone, and nor due to his life." (Al-Albaani, 1951: 4).

Similar to the views of White (1945) that losses of natural hazards, or what is classified as disaster, Islam considers any type of harm, including disasters, caused to man is the acts of man and his corruption. God mentions clearly in the Holy Quran that evil and harm are the acts of man, not God:

"Whatever of good reaches you, is from Allah, but whatever of evil befalls you, is from yourself" (4: 79)

Some Muslim scholars might argue that the Holy Quran has many stories about people who were punished by floods, earthquakes or windstorms. For example, when the people of Messenger Noah rejected his call to obey the orders of God, they were punished by flood, as is mentioned in the Holy Quran:

The people of Noah rejected the Truth before them; they rejected Our servant and said: A madman spurned by our gods. He called on his Lord: I am overcome; do Thou avenge me. Thereupon, We opened the gates of heaven (the skies) with water pouring down; and We caused the earth to burst forth with springs, so the two waters met for a purpose, which had been predetermined". [54:10-13]

Based on such stories in the Holy Quran, some Islamic scholars claim that natural hazards are punishment by God sent to sinful people. In the researcher's opinion, these stories of using natural hazards as an instrument for punishment by God are exceptional and not the norm in life. That is because all of these stories happened with people who rejected to follow the teachings of messengers and prophets at that time and arrogantly challenged God. As a matter of prophets and messengers' miracles, God tortured those sinful people after warning them many times, as is mentioned in many occasions in the Holy Quran:

"And never would We punish until We sent a messenger." (17: 15)

"We have not destroyed any town without its having warners." (25: 209)

In other words, those people who were punished by God because they challenged God, tortured His messengers and invoked His punishment, so God punished those people with natural hazards and that punishment was to prove the fact that the messengers were the real messengers of God and they had miracles. This is exactly what makes some Muslims accept the fatalistic view of natural hazards and reject disaster risk reduction. However, these stories are special to the messengers and prophets of God and their people who challenged God and invoked His punishment. These stories cannot be overgeneralized to our current life because in Islam Prophet Mohammad (Peace be upon him) was the last prophet sent by God to humanity.

Importantly, if you do not take protective procedures to face any kind of disasters, you are sinful in Islam. This is clearly mentioned in the Holy Quran:

"...and do not throw yourselves into destruction." (2:195)

In this case, if you build your house in a flood plain or near an active volcano, you make yourself and your family vulnerable to natural disaster. If any disaster happens, you will become sinful in Islam because you caused damage and destruction to yourself and people around you.

In short, it can be said that natural hazards are the acts of God in Islam, but natural disasters and their losses are the acts of man.

7.6 Integration of Islamic Teachings into the Policy of Disaster Risk Reduction in Saudi Arabia

If we have to integrate the teachings of a faith into the policies and strategies of disaster risk reduction, it is very important first to know the religious attribution of that faith (McGeehan and Baker, 2016). As was shown in Section 7.2, natural disasters, according to the Islamic teachings, are not necessarily a punishment by God. Other interpretations are possible by Islam, such as warning of great things might happen, a test from God to believers or a dangerous change in the divine universal balance created by God. It is true that God mentioned many examples of sinful people who were punished by natural disasters, such as earthquakes or floods, but that was after sending many warning signs, messengers, and prophets to them and they arrogantly challenged God and invoked His punishment. Therefore, such natural disasters were special miracles to the messengers and prophets of God.

The results of participants in this study showed that they did not strongly believe in the extreme version of the fatalistic view of natural disasters. On the contrary, they showed strong belief in the scientific methods and procedures, such as early warning systems, that are used in disaster risk reduction. They also believed that people in the Kingdom of Saudi Arabia can help to mitigate the risks of natural disasters. Therefore, they were enthusiastic to be involved in any efforts on training on disaster risk perception and reduction. However, the majority of participants from all provinces, as was seen in the results chapter, lacked enough knowledge and information on potential natural disasters in their provinces and how to face such possible disasters. This indicates that the policies and strategies of disaster risk reduction, which are applied in the Kingdom of Saudi Arabia, are not effective. Hence, new policies and strategies should be drawn taking into account the culture and faith of the Saudi society because faith and

culture, as was shown in Section 7.3, is on par with science in making sense of natural disasters and help policy makes for effective disaster risk reduction.

Based on what has been discussed so far, there are some suggestions that should be taken into account by decision makers to integrate Islamic teachings into any policy of disaster risk reduction in the Kingdom of Saudi Arabia. These suggestions can be summarized as follows:

- **Raising Awareness**

The common view among people, especially the less educated, is based on the fatalistic view. That is, natural disaster are a suffering instrument sent by God to punish sinful people, warn people or test their belief and patience. If such a view is taken for granted by people, all procedures and policies for disaster risk reduction will be pointless, because nothing can change what is destined by God. In this regard, Baytiyeh and Naja (2014: 347) point out that “in most Middle Eastern communities, where God is believed to control future events, including earthquakes, people tend to believe that there is little chance of preventing or avoiding the eternal and unchangeable will of God.” In such a scenario, there should be raising awareness that natural disasters might not be punishment by God, but they might be a natural outcome of violating the natural divine balance by God and the corruption of man. For example, if the authorities in charge of a certain community allow people to live in an area vulnerable to a natural disaster, such as floods, such people will be vulnerable to the natural disaster and suffer the most. In this case, it is not a punishment from God, but the acts of man. If people understand this logic, they will be proactive in applying the strategies and policies of disaster risk reduction.

Raising awareness about disaster risk reduction, especially in communities where the fatalistic view strongly prevails, is a very challenging and sensitive issue. That is because if you interpret Islamic teachings in a way different from the general understanding of the public, you might be sinful in their opinion. Therefore, this issue should be tackled with caution. As a government, the best thing to raise awareness about disaster risk reduction is to follow a good plan agreed upon by many parties, such as religion leaders and civic leader. The government can raise awareness starting from schools and the education system. Coburn and Spence (2006) argue that the education is the best effective and fastest method to raise awareness about

disaster risk reduction in vulnerable communities. In this case, Baytiyeh and Naja (2014: 348) argue that, “in order to effectively accelerate the implementation of disaster risk reduction across these communities, a reform of both curriculum contents and teaching strategies is necessary. Such suggestion is crucially needed to reduce the existing fatalistic views regarding disasters.” Baytiyeh and Naja (2014: 352) recommend some suggestions and changes in the education system in the Middle East to change the extreme belief in the fatalistic view of disaster risk reduction:

- the incorporation of new teaching approach that rejects indoctrination through the implementation of critical thinking techniques in teaching all fields of study and at all levels of education;
- the integration of disaster risk education formally and informally in schools’ programmes at all levels; and
- the collaboration of educational institutions with religion teachers to ensure that religious teachings are constructively taught to children by qualified, trained, open-minded teachers.

In addition to the education system, the government can benefit from the media to change the existing extreme fatalistic views because, as was seen in Chapter Six, different forms of media were the first source of information for the majority of participants. There can be many TV or radio programs, which host religion leaders and discuss the Islamic view of natural disasters and the importance of disaster risk reduction as a requirement in Islam.

- Training faith leaders on disaster risk reduction

If faith leaders strongly believe in the extreme version of the fatalistic view of natural disasters, the public will naturally follow their leaders. Therefore, it is very important for the government and the different parties involved in disaster risk reduction to discuss the fatalistic views with faith leaders and arrange discussions between faith leaders from different backgrounds about the importance of disaster risk reduction to save the life of people, which is a noble mission in Islam. If faith leaders accept that disasters might not be a punishment from God but the acts of man, such faith leaders should be trained to know how to face disasters. In fact, training faith leaders is very important because they will be sub-trainers in their communities. Faith leaders usually occupy a very important and high status in their communities. People always see them as people of good morals and trust. If the imam in the mosque asks people to attend training sessions in the mosque on how to face disasters, people will happily accept this invitation. Moreover, if people see their imam as their trainer, they will understand this is something important in their religion.

- **Activating the role of mosque in disaster risk reduction**

The mosque nowadays is just a place for worshipping God and performing the Islamic rituals, such as the five prayers a day. The majority of men in the community also go to the mosque every Friday to perform the Friday prayer and listen to their imam's khutba (religious lecture), which is obligatory on every capable and healthy Muslim. However, as was shown in Section 3.4.3, the mosque can be more than a place for worshipping God. It was similar to a local administrative authority that can help people in everything related to their life and safety in this life and hereafter. The Imam in the mosque can change the role of mosque in DRR, as was shown in the previous paragraph.

The mosque, as was shown in Section 3.4.3, has many factors that make it the best potential place for effective disaster management. For example, Intan et al. (2015) argue that the mosque usually occupies a central position in the community, which makes it accessible by all the members of the community. Wisner (2010) also says that religious institutions, such as the mosque, are very important in disaster risk reduction because the mosque is usually the first respondent in the time of disasters and it has very good relations with the local community. The Tannguh Masjid concept, which was proposed by Saputra et al. (2014) and mentioned in Section 3.4.3 above, should be considered by decision makers and faith leaders in the Kingdom of Saudi Arabia. Based on the suggestions by Cheema (2012), the mosque in the Kingdom of Saudi Arabia can have very important roles in disaster risk reduction, such as:

- 1- Roles during response and relief: the mosque have many roles during response and relief such as initial contact point, a coordination place for the efforts of response and relief, inclusion of the vulnerable, social integration and recruiting volunteers.
- 2- Roles during recovery and reconstruction: in this stage, the mosque can provide different types of important support such as psychological support, spiritual support and support for the livelihoods.
- 3- Educational roles: the mosque can be a very practical alternative option when schools are destroyed because of disasters. The mosque can also play a very important role in spreading awareness and changing the extreme belief in the fatalistic view of natural disasters. The mosque also has a very important influence on the local community so it can have training sessions on how to be well prepared to face natural disasters.

- 4- First aid provider: during disasters, the mosque can provide first aid and basic health support to the affected people who cannot be easily reached by the health authorities, especially in villages and distant areas.
- 5- Financial support centre: during disasters, the mosque can financially help the affected people. The mosque usually collects donations and zakat to help the vulnerable people in the community, and this collection of donations accelerates at the time of disasters because people trust the religious leader in the mosque and generously answer his request for more donations.
- 6- A centre for information sharing and coordination: if any organization wants to see the local people and spread awareness about disaster risk reduction, the mosque can be a very useful place for sharing information and coordination because it can easily reach the local people, especially vulnerable people, and spread the message. Organizations involved in disaster risk reduction can also held their activities inside the mosque. The mosque also can report any concerns about possible disaster to the involved authorities and organizations.

➤ **Highlighting the importance of disaster risk reduction in Islam**

Religious leaders should try to change the common belief that natural disasters are just punishment from God, a warning sign from God or a test to the true believers. Leaders should explain that natural disasters can be destructive because of the corruption of man and negligence of the nature and the environment. The true believer should obey the teachings of the Holy Quran and Prophet Mohammad (Peace be upon him) who highlighted in many hadiths that man is the steward of God on this earth and he is obliged to protect the earth and all other creatures. All verses of the Holy Quran and hadiths by the prophet that talk about natural phenomena and the protection of nature should be stressed and explained. Moreover, verses and hadiths that talk about natural disasters as punishment from God should be discussed from different points of view because there are many interpretations of these verses or hadiths, and some of these interpretations do not consider natural disasters as a punishment from God.

➤ **Activating the role of the Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance in Disaster Risk Reduction**

As mentioned in Section 4.4.2.1, the main role of the Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance in the Saudi national plan to face natural disasters is restricted to identify and supervise mosques that will be used as shelters during natural disasters. However,

this role is very limited and can be changed to make this ministry more active in disaster risk reduction. The results of this study showed that the mosque has a special status in the life of every Muslim, and Islam encourages proactive procedures in disaster risk reduction. Therefore, this ministry should play a very active role in disaster risk reduction. For example, there should be active cooperation between the Ministry of Education and the Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance to work on syllabus that shows the right perception of natural disasters in Islam and the role of Islamic teachings in disaster risk reduction. There should also be more cooperation between Civil Defence and the Ministry of Islamic Affairs, Endowments, Da`wah, and Guidance to hold workshops inside mosques to educate people about the possible natural disasters in their areas and how to face them.

➤ **Highlighting the importance of teamwork during disasters**

Teamwork is very important in our life, especially during disasters. Religious leaders should encourage people to think about other people, not just themselves. Many verses in the Holy Quran and hadiths talk about the importance of teamwork during disasters and calamities. God says in the Holy Quran:

“And cooperate in righteousness and piety, but do not cooperate in sin and transgression.”
(5: 2).

With regards to teamwork and cooperation to face disasters, Ramli et al. (2014: 34) say that “The concept of cooperation for righteousness (al-ta’awun) is an important element that leads to the success of both safety and disaster management as well as to develop an efficient safety management system from the aggregated consensus.” People should work together and allocate tasks to work on a disaster plan that was already discussed and adopted. For example, many vulnerable people are displaced during disasters, and they do not know anything about the new area, so the local people of the new area should work with displaced people on recovery and rehabilitation.

➤ **Involving Islamic Leaders in DRR strategies and policies**

When strategies and policies for disaster risk reduction are discussed and adopted by the local and national authorities or organizations, religious leaders should be involved. Sometimes, people may not follow the disaster risk reduction policies and strategies because of religious

reasons (McGeehan and Baker, 2016). Therefore, the authorities and organizations that work on disaster risk reduction should contact faith leaders and make them involved in all the steps and stages of disaster risk reduction planning. McGeehan and Baker (2016: 19) point out that such fruitful cooperation serves many objectives such as:

- (i) building bridges between faith and civic leaders;
- (ii) preparing faith leaders for creating a DRR framework within their communities;
- (iii) providing disaster managers with better access to faith leaders as resource hubs;
- and
- (iv) the establishment of information-sharing networks among disaster managers and faith leaders will open lines of communication and allow the field to identify needs and strengths that will lead to more resilient and better-prepared communities.

This cooperation between civic leader and faith leaders for disaster risk reduction is very important because if any disaster risk reduction plan is supported by religious leaders, such a plan is expected to be widely implemented by the local people.

Chapter Eight: Conclusion, Limitations and Recommendations

8.1 Introduction

This research investigated disaster risk reduction (DRR) in the Kingdom of Saudi Arabia with the main focus on the role of culture, especially the faith of Islam, in reducing the risks of natural disasters. The main focus of the research was to investigate four main points, which are:

- 1- To investigate the perception and preparedness Saudi citizens to face weather related natural disasters in the Kingdom of Saudi Arabia
- 2- To analyze the efforts of the Kingdom of Saudi Arabia in disaster risk reduction
- 3- To evaluate the concept of natural disasters in Islam
- 4- To investigate the role of Islam in disaster risk reduction

The research used a mixed approach, which relied on a questionnaire, interviews and a focus group interview, to collect information from four different provinces in the Kingdom of Saudi Arabia. These provinces are: Riyadh Province, Makkah Province, the Northern Province and the Eastern Province.

8.2 Summary of the Main Findings

With reference to the first point about the perception and preparation of Saudi people to face natural disasters, this research found that the Saudi people do not know much information about natural disasters in their country and they are not prepared to face the risks of disasters. Therefore, they do not know which natural disasters might affect their areas and why such disasters might occur. Such conclusion was supported by previous research, such as Alshehri et al (2013) and Azim and Islam (2016), which also found the majority of Saudi people lack important information about natural disasters and how to face their risks. However, the participants in this research found to be aware of the different impacts of natural disasters on their country, which is also supported by the findings of Alamri (2011), Abosuliman et al. (2013), Al-Qahtani (2014), Azim and Islam (2016) and Rahman et al (2016) who found that

Saudi people are aware of the impacts of natural disasters, but they lack training and awareness in responding to natural disasters. It is surprising that natural disasters have been very frequent in the last decade, but the parties involved in DRR have not been able to spread disaster awareness among people. If the main purpose of DRR is to save the lives of people and their properties, local people should be educated and know about the potential natural disasters in their province and how to face such disasters if they occur. Such findings mean that the reaction of people and the government in this study is reactive rather than proactive. The Saudi people do not know much about natural disasters and they react to them when they occur. The Saudi government should pay special attention to this issue, educate and train people in advance to know the necessary information about the possible natural disasters in their provinces and how to mitigate their risks. The Saudi government, according to the findings of this study, should benefit from the different sources that could raise awareness of natural disasters and DRR. This study has shown that Saudi citizens, in the main, get information about disasters from the media and governmental agencies. Raising awareness of DRR among people is one of the most important steps that should be done to make people proactive rather than reactive in DRR.

With reference to the second point about the efforts of the kingdom to mitigate the risks of natural disasters, this research has shown that the Saudi government has a national plan and different parties are involved in the design and implementation of DRR strategies. However, the progress and success of the kingdom in DRR has been very slow. These findings agree with Alamri (2011), Abosuliman et al. (2013), Al-Qahtani (2014), Azim and Islam (2016) and Rahman et al (2016) who found the Saudi government is reactive in DRR. The Kingdom of Saudi Arabia, as was shown in this research, has developed (and continues to) very rapidly in the last 50 years. This development has introduced new hazards into the kingdom. Therefore, those parties involved in DRR in the Kingdom of Saudi Arabia should be proactive more than reactive in mitigating the risks of natural disasters by reducing the vulnerability of people to natural disasters and preparing the country in advance to face the risks of disasters. As the Islamic teachings encourage the protection of this universe and every creature on it, the Saudi government should benefit from the Islamic proactive view of natural disasters and activate the role of the different Islamic institutions and organizations to highlight the importance of DRR in Islam and prepare people to mitigate the risks of natural disasters. For example, the mosque today is just a place for worship and it does not have any active roles in the daily life of communities although the mosque has a strategic position and status in life of every Muslim.

This study discussed the possible roles that a mosque can play in DRR, not only when natural disasters happen, but also before and after they take place.

With reference to the third point about the concept of natural disasters in Islam, this research found that natural disasters are seen in Islam as a test, a reminder or a warning sign from God more than being an inevitable divine punishment, which contradicts the fatalistic view of natural disasters. This finding was also supported by Azim and Islam (2016) who also found natural disasters are seen by Muslims as a test or warning sign from God more than being a punishment. This finding is very important and central in this research because if the Saudi people believed in the extreme version of the fatalistic view of natural disasters, they would not look at DRR, or even consider it forbidden and against the will of God. The wrong common belief that Islam adopts an extreme version of fatalistic view of natural disasters, as was shown in Section 7.4, might be attributed to lack of clear difference between disasters and hazards in Islamic discourse. Therefore, when Muslims talk about disasters/hazards from God, it is not clear whether they mean hazards or disasters. Even if a moderate version of the fatalistic view is adopted by some Muslims, this does not mean DRR is forbidden in Islam. The findings of this study agree with Chester and Duncan (2009) and Chester et al's (2013) concept of parallel practice which is practically applied by Muslims who do not see any contradiction between the teachings of their religion and DRR.

With reference to the fourth point about the role of Islamic teachings in DRR, this research has shown that when Muslims talk about disasters/hazards from God it is not clear if they mean hazards or disasters. This study has clarified this difference and shows that the Islamic perspective agrees with White's (1945) view that hazards are from God, but disasters are the acts of man. Importantly, this research has shown that DRR largely agrees with the main principle in Islam. This principle states that this universe and all the creatures on it are blessings and bounties to man by God, and man is asked by God to preserve and protect the earth because God made man His steward on the earth. Doing good deeds includes the protection of everything on this earth. Islamic teachings, contrary to the commonly held, but wrong belief, encourages any efforts to save the lives of people. Many examples and stories in the Holy Quran and the teachings of Prophet Mohammad (Peace be upon him) encourage Muslims to avoid disasters by taking protective procedures. The protection of nature, the environment and

other people around you is a kind of worship in Islam, and God has clearly mentioned in the Holy Quran that He will reward people who save the lives of other people. It was also shown in this study that many Islamic scientists and scholars provided scientific explanations of natural disasters and described scientific methods to mitigate their risks. Such findings agree with Chester et al. (2013) who found that Muslims have strong belief in the religious interpretation of natural disasters, but they do not reject volunteering and helping in the policies and strategies of disaster risk reduction. This point should be highlighted to the general public in the Kingdom of Saudi Arabia to clear misconceptions about the fatalistic view of natural disasters and rejection of the principles and strategies of DRR.

This research stresses on the importance of culture, especially religion, in DRR in the Islamic World, in general, and the Kingdom of Saudi Arabia, in particular. This research proposed some suggestions that should be taken into account by decision makers to integrate Islamic teachings into any policy of disaster risk reduction in the Kingdom of Saudi Arabia. These suggestions focused on: a) raising awareness about natural disaster and their meaning in Islam; b) training faith leaders on DRR; c) activating the role of mosque in DRR; and d) involving Islamic leaders in the policies and strategies of DRR.

8.3 Contribution to Knowledge

This study significantly contributes to knowledge on disaster risk reduction. First, it discusses culture as an important factor for effective disaster risk reduction. Science alone is not enough to reduce the risks of natural disasters because the application of scientific procedures in disaster risk reduction might sometimes be hindered by cultural values and traditions. Therefore, the culture of a community should be considered to make that community resilient to natural hazards. Second, this study is the first of its kind in the Arab World, in general, and in the Kingdom of Saudi Arabia, in particular. Although the topic of effective disaster risk reduction is under-researched in the Arab World, the reported research has not addressed the role of culture in disaster risk reduction. Third, this study, according to the researcher's knowledge, is the first study in the literature that addresses the role of Islam in disaster risk reduction. It clarifies the misconception about the relation between Islam and science, and it showed the perception and role of Islamic teachings in disaster risk reduction. Importantly, the

study suggested a practical strategy to integrate the teachings of Islam to the planning of disaster risk reduction in the Kingdom of Saudi Arabia.

8.4 Limitations of the Study

Although the researcher tried his best to be comprehensive in this this research, some limitations were inevitable. First, the civil conflict in Yemen and the Saudi efforts in spreading peace and settlement there had an effect on this study. For example, the researcher planned to collect data from Jazan Province to cover all the areas in the kingdom, but he could not get a permission to collect data from Jazan Province because people there were very worried about the war in Yemen, especially Jazan is located at the borders of Yemen, and there was serious risk on the life of participants there. Also, the researcher could not meet many people in charge of disaster risk reduction in the Kingdom of Saudi Arabia because they were very busy with what is going in Yemen and instability in the neighbouring countries, such as Syria and Iraq. More interviews with people in charge of DRR in Saudi Arabia will be an item for future research. Second, the topic chosen by the researcher has been under-researched in the literature, so the researcher could not form better understanding of the topic before data collection and results analysis. Third, there was clear lack of information about disaster risk reduction in the Kingdom of Saudi Arabia, so the researcher struggled to find information about disaster risk reduction in the Kingdom of Saudi Arabia. Fourth, the opportunity to benefit from the questionnaire to guide the focus-group discussion was missed. A more progressive approach will be an item for future research.

8.5 Recommendations for Further Research

This study investigated a topic that is under-researched in the literature of disaster risk reduction in preference of science and scientific methods to mitigate the risks of natural disasters. The findings of this study are indicative, but not conclusive. The topic of the role of Islam in the perception and preparedness to mitigate the risks of natural disasters should be further researched in more Islamic countries to reach more comprehensive conclusion and dis/confirm the findings of this study. The difference between hazards and disasters should also be further researched in the Islamic context to know the difference in the conceptual meaning between these two terms and whether they are same or not.

Gender differences in the perception of natural disasters were nearly absent in this study, which is accounted by the researcher to the effect of education on the perception of natural disasters. In this regard, it is worth further researching to include educated and non-educated female and male participants to see whether education plays a role in the perception of disasters in the Kingdom of Saudi Arabia.

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Appendices

Appendix A: Survey Questionnaire

People's perception of Natural Disaster in the Kingdom of Saudi Arabia

Part 1 – Background information:

1. What is your gender? ما هو جنسك؟

Male ذكر O Female أنثى O

2. What is your age group? ماهي فئتك العمرية؟

16- 20 O 21- 30 O 31- 40 O

41- 50 O 51- 60 O 60+ O

3. What is your marital status? ماهي حالتك الاجتماعية؟

Married متزوج O Single أعزب O

4. What type of house do you live in? ما هو نوع المنزل الذي تعيش فيه؟

Flat شقة O House بيت O Villa فيلا O

Other أخرى O (يرجى التحديد) please specify:- -----

5. Where do you live (area)? في أي منطقة تعيش؟

O Riyadh الرياض O Makkah مكة المكرمة O Eastern area المنطقة الشرقية

O Northern area المنطقة الشمالية O Jazan area منطقة جازان

6. What is your level of education? ماهو مستواك العلمي؟

Primary school ابتدائي O

Intermediate school متوسط O

High school ثانوي O

Bachelor's Degree بكالوريوس O

Master ماجستير O

Doctorate دكتوراه O

Other, please specify:- أخرى (يرجى التحديد) -----

7. What is your job? ماهو عملك؟

Governmental employee موظف حكومي O

Private employee موظف قطاع خاص O

Businessperson رجل او سيدة اعمال O

Student طالب O

Retired person متقاعد O

Unemployed غير موظف O

Part 2 - Knowledge and perception questions of natural disasters:

8. Which of the following do you think can generate a Disaster? (You may choose as many as you like)

أياً من الفقرات التالية تعتقد أنها تسبب الكوارث؟ (يمكنك أن تختار ما تستطيع)

Earthquake	الزلازل	<input type="radio"/>
Flood	الفيضانات	<input type="radio"/>
Epidemic	الأمراض الوبائية	<input type="radio"/>
Volcanic eruption	البراكين	<input type="radio"/>
Tornado	الأعاصير	<input type="radio"/>
Landslide	الانزلاقات الأرضية	<input type="radio"/>
Tsunami	تسونامي	<input type="radio"/>
Conflicts	الحروب والنزاعات	<input type="radio"/>

9. Do you think the area where you live might be affected by nature-related disasters?

هل تعتقد أن المنطقة التي تعيش فيها يمكن أن تتعرض للكوارث الطبيعية؟

Yes ☐ No ☐ Don't know ☐ لا أعلم ☐

10. How worried are you about the nature-related disasters in your area?

ماهي درجة قلقك من حدوث الكوارث الطبيعية بمنطقتك؟

Very worried	قلق جدا	<input type="radio"/>
Fairly worried	قلق نوعا ما	<input type="radio"/>
Not very worried	لست قلق جدا	<input type="radio"/>

Not at all worried ☐ لست قلق نهائيا ☐

Don't know ☐ لا أعلم ☐

11. According to your belief, what causes natural disasters?

(You may choose more than one)

وفقاً لمعتقدك، ماذا يسبب الكوارث الطبيعية؟ (يمكن أن تختار أكثر من خيار)

They are from Allah ☐ هي من عند الله ☐

They are natural processes ☐ هي عمليات طبيعية ☐

People's disregard for natural environment ☐ إهمال الناس للبيئة الطبيعية ☐

They are caused by both natural processes and human activity. ☐

تحدث الكوارث نتيجة نشاطات طبيعية وبشرية

All mentioned above ☐ كل ما سبق ☐

I do not know ☐ لا أعرف ☐

12. According to your faith, natural disasters are:

Anger sign from Allah ☐ علامة على غضب الله ☐

Test from Allah ☐ اختبار من الله ☐

Punishment from Allah ☐ عقاب من الله ☐

All mentioned above ☐ كل ما سبق ☐

I do not know ☐ لا أعرف ☐

13. What is the importance of the following impacts for natural disasters? (1=

least important to 5= most important)

ماهي أهمية التأثيرات التالية للكوارث الطبيعية؟ (١ = أقل أهمية، ٥ = مهم جداً)

• Economic impacts	تأثيرات اقتصادية	1	2	3	4	5
• Social impacts	تأثيرات اجتماعية	1	2	3	4	5
• Human impacts	تأثيرات إنسانية	1	2	3	4	5
• Environmental impacts	تأثيرات بيئية	1	2	3	4	5

14. What is the importance of the following sources to know about natural disasters? (1= least important to 5= most important)

ماهي أهمية المصادر التالية للمعرفة عن الكوارث الطبيعية؟ (١ = أقل أهمية، ٥ = مهم جداً)

• Friends	الإصدقاء	1	2	3	4	5
• Media	وسائل الإعلام	1	2	3	4	5
• Government	الحكومة	1	2	3	4	5
• Mosque	المسجد	1	2	3	4	5
• Internet	الإنترنت	1	2	3	4	5

Part 3- Preparation for natural disasters.

15. To what extent are you prepared for natural disasters? إلى أي مدى أنت مستعد

لمواجهة الكوارث الطبيعية؟

I am well-prepared	أنا مستعد بشكل جيد	<input type="radio"/>
I am not prepared	أنا غير مستعد	<input type="radio"/>
I do not know	لا أعرف	<input type="radio"/>

16. Do you think that people can generally take actions to minimize risks in

the case of the outbreak of natural disasters such as floods, earthquakes

and volcanoes in Saudi Arabia?

هل تعتقد أن الناس بشكل عام يستطيعون اتخاذ إجراءات للتخفيف من مخاطر الكوارث الطبيعية

مثل الفيضانات و الزلازل و البراكين في المملكة العربية السعودية؟

Completely agree أوافق بشدة ☐

Mostly agree	أوافق	<input type="radio"/>
Mostly disagree	لا أوافق	<input type="radio"/>
Completely disagree	لا أوافق بشدة	<input type="radio"/>
Don't know/ refused	لا أعلم/رفض	<input type="radio"/>

17. Would you like to be active in taking steps to protect your home and family from the risks of natural disasters?

هل تريد أن تكون نشيطاً في اتخاذ خطوات لحماية منزلك و عائلتك من مخاطر الكوارث الطبيعية؟

Yes نعم ☐ No لا ☐

18. Did you take part in any preparation exercise in Saudi Arabia about natural disasters?

هل شاركت بتدريبات للتعامل مع الكوارث الطبيعية في المملكة العربية السعودية؟

Yes نعم ☐ No لا ☐

19. What is the importance of the following in reducing the risks of natural disasters?(1=least important, 5= most important)

ماهي أهمية العوامل التالية في التخفيف من مخاطر الكوارث الطبيعية؟ (١ = أقل أهمية, ٥ = مهم جداً)

- | | | | | | |
|--|---|---|---|---|---|
| • Risk awareness مستوى الوعي | 1 | 2 | 3 | 4 | 5 |
| • Early warning system نظام إنذار مبكر | 1 | 2 | 3 | 4 | 5 |
| • Disaster management خطة لإدارة الكوارث | 1 | 2 | 3 | 4 | 5 |
| • Mosque المسجد | 1 | 2 | 3 | 4 | 5 |
| • Help from others المساعدة من الآخرين | 1 | 2 | 3 | 4 | 5 |

20. What is the importance of the following roles of a mosque in reducing the risks of natural disasters?(1=least important, 5= most important)

ماهي أهمية الوظائف التالية للمسجد في التخفيف من مخاطر الكوارث الطبيعية؟ (١= أقل أهمية, ٥=

مهم جداً)

- | | | | | | |
|--|---|---|---|---|---|
| • Place of shelter مكان إيواء | 1 | 2 | 3 | 4 | 5 |
| • Provides training for preparation تدريب الناس للإستعداد لمواجهة الكوارث | 1 | 2 | 3 | 4 | 5 |
| • Educates people about natural disasters تثقيف الناس حول الكوارث الطبيعية | 1 | 2 | 3 | 4 | 5 |

Appendix B: Pilot Study Results

Table 1: Background information of pilot study participants

Question	Choices	Number of respondents
Gender	Male	6
	Female	
Age group	16-20	
	21-30	1
	31-40	3
	41-50	2
Marital status	Married	5
	Single	1
Type of house	Flat	1
	House	4
	Villa	1
	Other	
Region	Riyadh Province	1
	Makkah Province	1
	Eastern Province	1
	Northern Province	1
	Jazan Province	1
Level of Education	Primary school	
	Intermediate school	
	High school	
	Bachelor Degree	1
	Master	3
	Doctorate	2
Job	Governmental employee	5
	Private employee	
	Businessperson	
	Student	
	Retired	
	unemployed	1

Table 2: Pilot study participants' perception and knowledge of nature-related disasters.

No.	Question	Choices							
8	Which of the following do you think can generate a Disaster?	Earthquake	Flood	Epidemic	Volcanic eruption	Tornado	Landslide	Tsunami	Conflicts
	Answers	4	5	3	3	4	1	3	5
9	Do you think the area where you live might be affected by nature-related disasters?	Yes		No		Do not know			
	Answers	3				3			
10	How worried are you about the nature-related disasters in your area?	Very worried		Fairly worried	Not very worried	Not at all worried		Do not know	
	Answers			1	4	1			
11	According to your belief, what causes natural disasters?	They are from Allah		They are natural processes	People's disregard for natural environment	They are caused by both natural processes and human activity.		All mentioned above	I don't know
	Answers	6		1	3	2			
12	According to your faith, natural disasters are:	Anger sign from Allah		Test from Allah		Punishment from Allah		I do not know	
	Answers	3		6		3			
13	Which of the following can be the most important impact for natural disasters?	Economic impacts		Social impacts		Human impacts	Environmental impacts		I do not know
	Answers	2		1		3	2		

Table 3: Pilot study participant's perception and knowledge of nature-related disasters (continued)

Question No.	Question	Sources	Choices				
			1	2	3	4	5
14	What is the importance of the following sources to know about natural disasters? (1= least important to 5= most important)	Friends	4		2		
		Media	1			2	3
		Government		1	1	2	2
		Mosque	3		1		2
		Internet	1	1	1	1	2

Table 4: Pilot study Participants' preparation for natural disasters.

Question No.	Question	Choices				
15	To what extent are you prepared for natural disasters?	Well prepared		Not prepared		Do not know
	Answers		4		2	
16	Do you think that people can generally take actions to minimize risks in the case of the outbreak of natural disasters such as floods, earthquakes and volcanoes in Saudi Arabia?	Completely agree	Mostly agree	Mostly disagree	Completely disagree	Do not know/refused
	Answers	2	2	1	1	
17	Would you like to be active in taking steps to protect your home and family from the risks of natural disasters?	Yes			No	
	Answers	6				
18	Did you take part in any preparation exercise in Saudi Arabia about natural disasters?	Yes			No	
	Answers				6	

Table 8: Pilot study Participants' preparation for natural disasters (continued)

Table 6: Pilot study Participants' preparation for natural disasters (continued)							
Question No.	Question	Sources	Choices				
			1	2	3	4	5
19	What is the importance of the following in reducing the risks of natural disasters? (1=least important, 5= most important)	Risk awareness			1	2	3
		Early warning system			1	1	4
		Disaster management			1	2	3
		Mosque		2	3		1
		Help from others	1	1	2	1	1
20	What is the importance of the following roles of a mosque in reducing the risks of natural disasters? (1=least important, 5= most important)	Place of shelter	1		2	2	1
		Provide training for preparation	1	2	2		1
		Educate people about natural disasters			1	1	4

Appendix C: Attendance Report of Research Training

Attendance Report

Page 1 of 1



Post Graduate Research Training

TURKI.ALSHADADI Attendance Report

Programme Title	Programme Date
Induction for Postgraduate Research Students	20/01/2014
Being a University Lecturer	07/05/2014
Annual Progression: what you need to know	11/06/2014
Jobsearch, Applications and CVs	29/01/2014
Managing your Research Data Session One: Introduction and Planning	12/02/2014
Writing your Research	27/02/2014
The Resilient Researcher	13/03/2014
How to be an effective researcher	14/05/2014
Induction to Northumbria for Postgraduate Research students	22/07/2014
Making the most out of conferences	20/05/2014
Getting Published - Successfully!	21/05/2014
Overcoming Writing Blocks	10/06/2014
Annual Progression: Preparing for the Panel	09/10/2014
An Introduction to Research Management	05/02/2015
Surviving your Doctorate	08/07/2015
Doctoral Dilemmas: writing up and submitting	13/07/2015
Developing your Academic Writing (P021)	18/10/2016
Bringing Impact to Life	19/10/2016
Write Club (P032)	03/11/2016
Faculty Ethics Training - Engineering and Environment (S005)	26/10/2016